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AMERICAN GAS JOURNAL

Established 185; Pioneer of the Gas Industry

Manufactured and Natural Gas

"LIGHT ONE LITTLE MATCH....set one little dial....and your heating work is done for the Winter." That's the compelling headline of the second of a series of advertisements on the Estate Gas Heatrola which will appear in The Saturday Evening Post this Fall. To more than three million householders it will say, "Automatic Gas Heating is now within your means." That will be front-page news in your territory—and a front-rank opportunity to increase your house-heating load. There's still time to get organized for a Fall campaign directed to this mass market. Write or wire to The Estate Stove Company, Hamilton, Ohio, for full details.

MODERNIZATION OF BY-PRODUCT COKE PLANTS

• When Koppers plants supplement or partially replace existing equipment, they bring new vigor to the entire coke and gas producing structure. Whether the addition consists of Becker ovens, by-product apparatus, or a material handling plant, its relation to the customer's equipment and business is carefully worked out in terms of current operating and sales practice.

• The result is a unified, revitalized plant that makes new records in production and efficiency.

• Our engineers will be glad to help you consider the application of Koppers plants to your coke and gas requirements.

KOPPERS CONSTRUCTION COMPANY

KOPPERS BUILDING **PITTSBURGH**

AMERICAN
GAS JOURNAL
Established 1859 — *Pioneer of the Gas Industry*

Manufactured and Natural Gas

Executive and Editorial Offices, 53 Park Place, New York City
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S. G. Krake, *President and Treasurer* — A. M. Gleason, *Secretary*

H. M. Riley, *Editor*

R. S. McBride, *Consulting Editor*, Washington, D. C.

Vol. 135, No. 3 — September, 1931 — Whole Number 3693

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681 Market St., San Francisco, Cal.

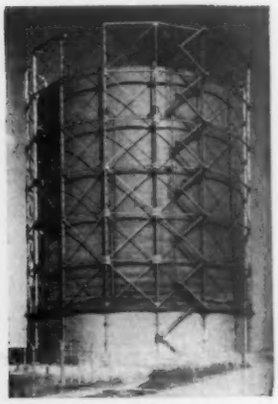
F. P. Curley, *Service Department,*
53 Park Place, New York

AN INDEPENDENT ORGANIZATION

THE STACEY MANUFACTURING CO.

DESIGNERS, FABRICATORS AND ERECTORS OF

GAS HOLDERS OF BOTH HIGH AND LOW PRESSURE TYPES
GAS PLANT EQUIPMENT AND STEEL PLATE CONSTRUCTION



LOW
PRESSURE
HOLDERS

On July 14, 1931, Judge Stanley Matthews of the Court of Common Pleas of Hamilton County, Ohio, appointed Mr. W. E. Keplinger as Receiver, and issued an order providing that The Stacey Manufacturing Company continue as a going concern.

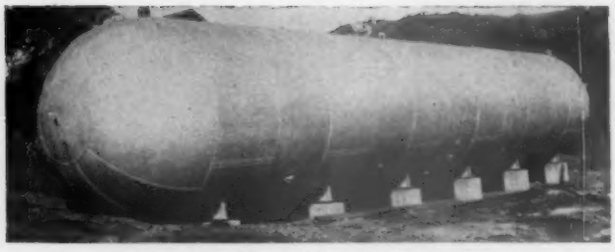
There is no question of finances involved, as the Company is in a particularly strong financial position; a controversy between certain stockholding interests being alone responsible for the Receivership.

The Court order contemplates that the Company be operated for the best interests of all stockholders and it therefore follows that there are no affiliations of any kind with other interests engaged in the same business.

We, therefore, solicit your business and ask that irrespective of what you may hear to the contrary, that inquiries for prices or any information be directed to THE STACEY MANUFACTURING COMPANY, CINCINNATI, OHIO, and assure you such inquiries will receive immediate attention.

Any contracts accepted and entered into by the Receiver, must and will be carried out to completion in accordance with requirements of the contract, the same as has been the policy of this Company during the past eighty years.

W. E. KEPLINGER
RECEIVER



HIGH PRESSURE HOLDERS

The Builders of Stacey Holders for Over 80 Years

NEW YORK OFFICE
52 Vanderbilt Avenue

CINCINNATI, OHIO

STACEY
SINCE 1851

"26 MEN ON A PIPE LINE'S CHEST"

Here are two lengths of **SEMET-SOLVAY WELDED STEEL PIPE,** 22″ in diameter, ⅜″ in thickness, length overall, 59′ 6½″, with four sleeve joints and connected "amidships" by a Van Stone Joint.

Regular construction practice recommends supports every 45′.

Note that the pipe, carrying two tons of live weight, remains rigid—without a suggestion of sag—unsupported for an excess distance one-third beyond the recommended maximum.

This photograph shows why SEMET-SOLVAY PIPING is regarded as the standard for comparison of these products.

Let us figure on your requirements.

Send for a copy of Bulletin No. 44, Semet-Solvay Piping and Valves

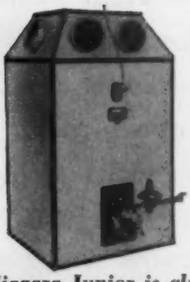
SEMET-SOLVAY ENGINEERING CORPORATION

40 RECTOR STREET NEW YORK, N. Y.

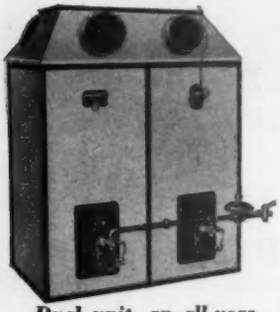
At Last!

GAS HEAT for

Niagara Junior can be connected to either side of the coal furnace.



Niagara Junior is also a complete gas furnace, suitable for homes of the proper size and type.

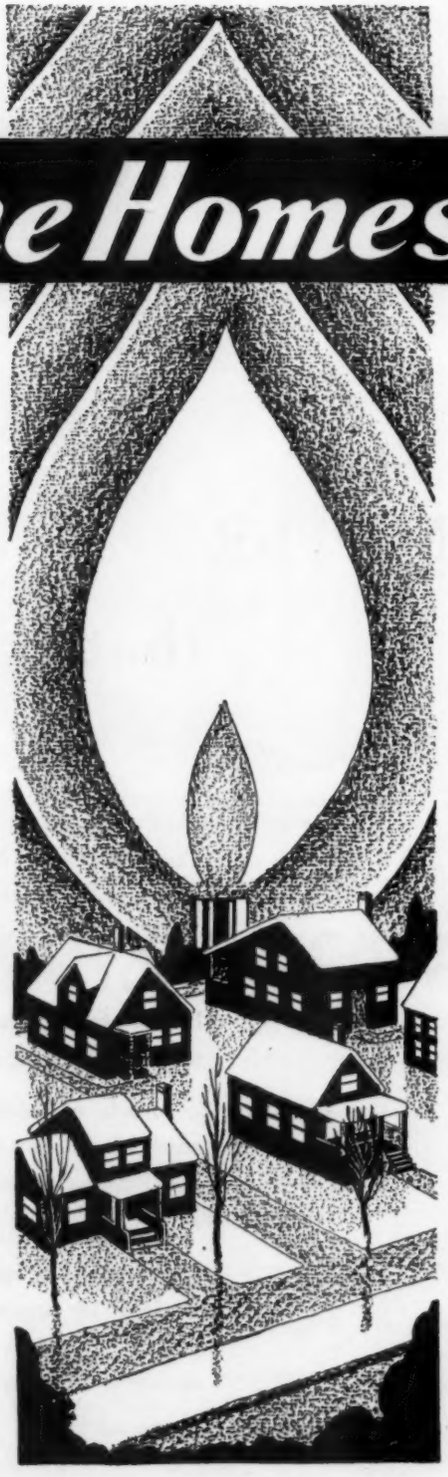


Dual unit, an all-year furnace by the addition of a second Niagara Junior.

PERFORMANCE that gives *most of the winter* all the advantages of the all-winter gas furnace—plus remarkable efficiency and economy. Operates alone or with the coal furnace—instantly ready for use, no put-in-take-out—durably built, attractive in appearance. Moderate in first cost. As an auxiliary makes practically no increase in annual fuel bills. For all-winter gas heat, simply add another Niagara Junior—replacing the coal furnace—without loss of the original investment.

The Niagara Junior is being exhibited at the A.G.A. Convention. It will be distinctly worth your while to see it.

Small Income Homes



A TRIPLE advantage is offered to Gas Companies by the Niagara Junior Auxiliary Gas Furnace.

1. A new and larger market in lower income brackets among users of warm air furnaces who have been wanting gas heat but who have felt they couldn't afford it—a group that comprises, on the average, 25% of your present customers.

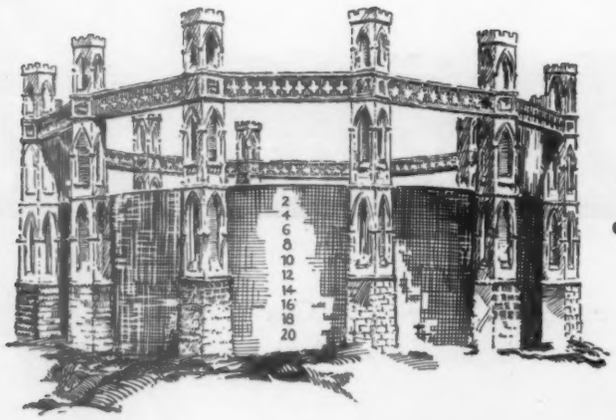
2. An opportunity to spread your winter load peak into a plateau by building up fall and spring gas heating.

3. Niagara Junior provides a powerful entering wedge for the sale of all-winter gas heating. It gives the user every one of the advantages of gas heating, making him want it all year. Then it provides the means merely by the addition of another inexpensive Niagara Junior unit.

See the Niagara Junior at the A.G.A. Convention or write for complete information.

The Forest City Foundries Company
Gas Equipment Division
2500 W. 27th St. *Cleveland, Ohio*

NIAGARA JUNIOR
GAS FURNACE



Gas Holder erected
in 1853
Capacity 1,800,000 ft.

METERS AND METER MAKERS

that have grown up with the industry

For 96 years Gas Meters from American Meter Company plants have been the key factor in recording growth of gas sales to the consumer.

In developing these meters the makers have worked hand in hand with the Gas Industry. They have unfailingly met new conditions and new requirements with equipment of proved performance.

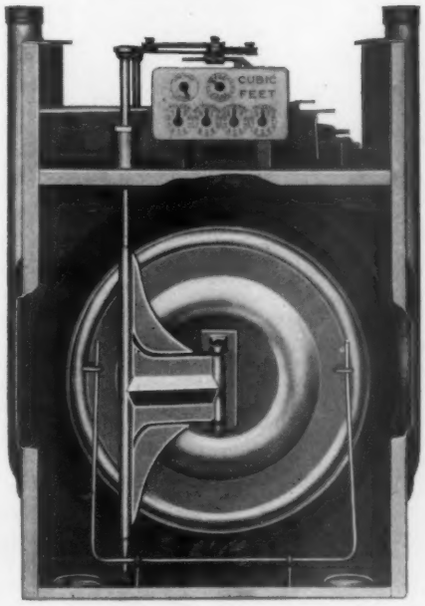
Such a policy has brought its own reward—confidence concretely expressed in millions of installations covering all phases of gas measurement.

American Meter Company factories are staffed by men who have grown up with the industry. Backed by unexcelled facilities for research and service they are ever on the alert to meet gas measurement requirements.

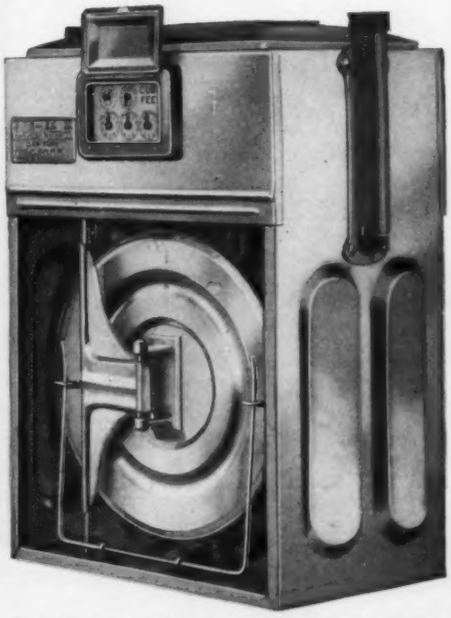
JOHN J. GRIFFIN & CO. Est. 1859 | HELME & McILHENNY Est. 1848 | D. McDONALD & CO Est. 1855 | METRIC METAL WORKS Est. 1888

MARYLAND METER WORKS Est. 1866 | NATH. TUFTS METER WORKS Est. 1860 | PACIFIC METER WORKS Est. 1901

Also C type meters (tinned steel case). Capacity range—600 to 17,500 cubic feet per hour. Six sizes.
Metric Iron Case Meters, Orifice Meters and Testing Apparatus



A type meters (tinned steel case). Rated capacity range—175 to 3400 cubic feet per hour at ½" differential. Five sizes.



B type meters (tinned steel case). Rated capacity range—150 to 7500 cubic feet per hour at ½" differential. Eight sizes.

Gas Meters that are not duplicated

AMERICAN METER COMPANY Gas Meters have every known requirement for true economy.

Collectively, these meters cover the entire range of Gas Company needs for measuring manufactured or natural gas. The line is complete. And the varying requirements of each section of the country are served by a manufacturing plant or a service station located in that area.

Individually, each meter has every quality necessary for accuracy and dependability—proper design and construction—proper metallurgical composition of parts—precise assembly—efficient operation.

Only an exact duplication of each feature in every detail can give an equivalent value.

High quality is true economy. American Meter Company Gas Meters will measure your Gas at lower cost. A nearby representative will be glad to discuss this with you.

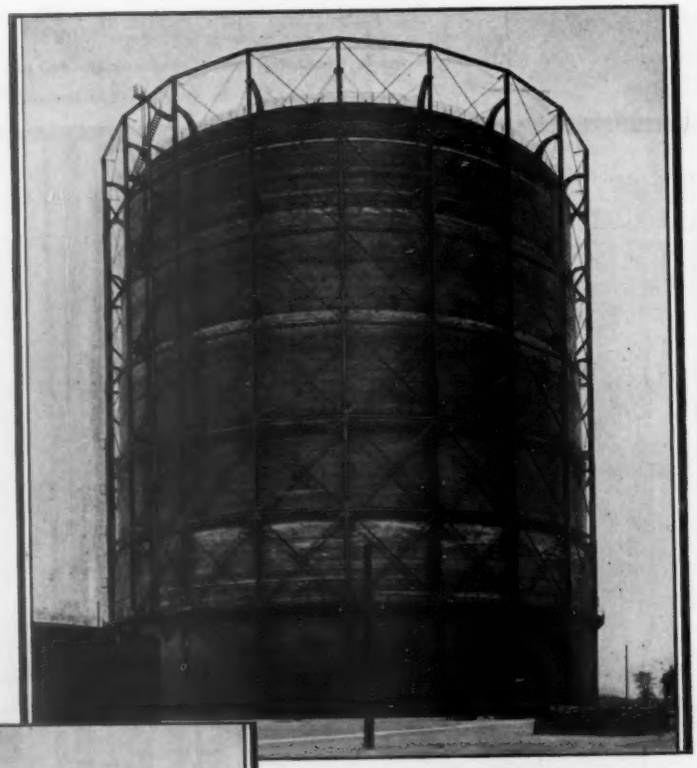
AMERICAN METER COMPANY
JOHN J. GRIFFIN & COMPANY
HELME & McILHENNY
MARYLAND METER WORKS
D. McDONALD & COMPANY
METRIC METAL WORKS
NATHANIEL TUFTS METER WORKS
PACIFIC METER WORKS

AMERICAN METER CO. MEASUREMENT ENGINEERS CUBIC FEET

AMERICAN METER COMPANY
INCORPORATED
The World's Largest Manufacturers of Gas Meters and Allied Apparatus
ESTABLISHED 1836
GENERAL OFFICES : 105 W. 40TH STREET · NEW YORK, N.Y.

SALES SERVICE ALBANY · BALTIMORE · BOSTON · CHICAGO · DALLAS · DENVER · ERIE · KANSAS CITY · LOS ANGELES · NEW YORK · PHILADELPHIA · PITTSBURGH · SAN FRANCISCO · TULSA

Our METHODS
in the building of
GAS HOLDERS
now assume a new
IMPORTANCE



We believe that, whether your inquiry for a Gas Holder be mailed tomorrow or ten years from tomorrow, you will be interested primarily in two kinds of minimum costs. You will insist on low initial cost compatible with lowest maintenance and operation.

That being so, you will recognize the value of Cruse-Kemper's methods in which both kinds of low costs combine. For years we have been builders of highest-quality installations. In these same years, in order to keep down the expense of quality erection, we have had to develop our technique to a point of greatest efficiency.

Each year has seen, and now sees, our progress in doing the finest kind of steel plate construction at a cost that recommends itself.

Manufacturers of GAS HOLDERS
and other major equipment units
for the GAS INDUSTRY.

CRUSE-KEMPER CO.
AMBLER, PA.

SPECIFY R-C-W GAS PUMPS

Heavy duty gas pump with capacity of 300,000 cu. ft. per hour against 10 lbs. pressure. Installed St. Louis. Note small Victor-Acme Blower in immediate foreground used to ventilate collector rings of motor.

FOR BOOSTER OR EXHAUSTER SERVICE

R-C-W gas pumps and exhausters are widely used throughout the industry. They are highly efficient and give dependable service over a long period of time in gas works, by-product coke plants, gas producers, oil refineries, chemical plants or wherever gas is required to be moved in large volume against pressure or suction.

Corrosive gases can also be pumped successfully by R-C-W units designed and constructed especially for the duty involved.

Write for complete details.

ROOTS-CONNERSVILLE-WILBRAHAM

DIVISION OF INTERNATIONAL-STACEY CORPORATION

12th St. and Columbia Avenue

CONNERSVILLE, INDIANA

New York Pittsburgh Columbus Cincinnati Chicago Detroit St. Louis Wichita
Tulsa Ft. Worth Houston Beaumont Shreveport Los Angeles Buenos Aires, Argentina

THE

Lux

LUX MATERIAL

BULK (UNMIXED)

Shipments from:— Boston, New York, Philadelphia, Baltimore, Mobile, New Orleans

LUX SPONGE

Shipments from our own Lux Sponge Plants in Philadelphia and Chicago.

MATERIAL

CHICAGO OFFICE:
343 SO. DEARBORN ST.
PHILADELPHIA OFFICE:
2767 GAUL ST.

THE ALPHA
192 FRONT STRE

BEST IS THE CHEAPEST—

has proved it!

Lux Gas Purifying Material lasts *three times* longer than others, thus avoiding the loss of gas, and the excess of labor of mixing materials due to too frequent filling and emptying of boxes.

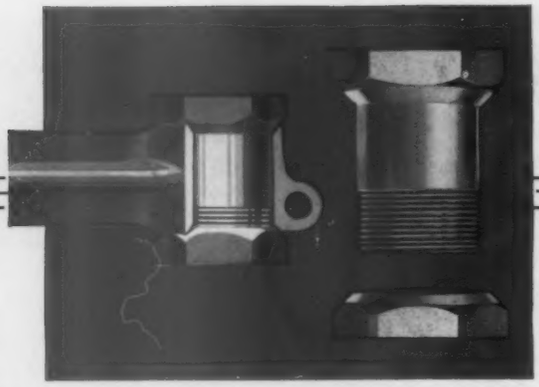
Lux becomes immediately active on entering the boxes, because of its enormous surface area made possible by its scientific preparation.

For smooth, trouble-free, dependable purification and lessened labor costs be sure to specify Lux or Lux sponge.

"LUXIT" H·T· CEMENT

For patching Hot Retorts, Refractory Linings, etc. It is shipped dry in 110 lb. bags, to save freight. Easy to mix--according to our simple directions--and is easy to use. Order sample shipment today!

LUX COMPANY, INC.
NEW YORK CITY, N·Y·



An enlarged and cut-away view showing the adjustable bevel cylinder principle.

No Union Joints . . . Fewer Connections

on

New MUELLER Meter Hanger

NOW a MUELLER Rigid Meter Hanger with many exclusive features! It is built with a new adjustable bevel cylinder which operates on the swivel principle, providing ample adjustment for connecting offset swivels to meter without placing the usual strain on meter tube screws.

The bevel on the cylinder and lock nut fit into a bevel recess and when tightened up make a rigid meter hanger that protects the meter from strains due to shifting of pipes and vibration.

Gas Companies are invited to write for full information of this new MUELLER product which represents such a substantial development in Meter Hanger construction.

MUELLER COMPANY (Established 1857). *Factory:* Decatur, Illinois; *Branches:* New York, Dallas, Atlanta, San Francisco, Los Angeles, Chicago. *Canadian Factory:* MUELLER, Limited, Sarnia.

G-11214 End inlet, Vertical adjustable cylinder outlet.

	Inlet	Outlet Swivel	Tapping
5 light	¾″	¾″	½″
10 light	1″	1″	¾″

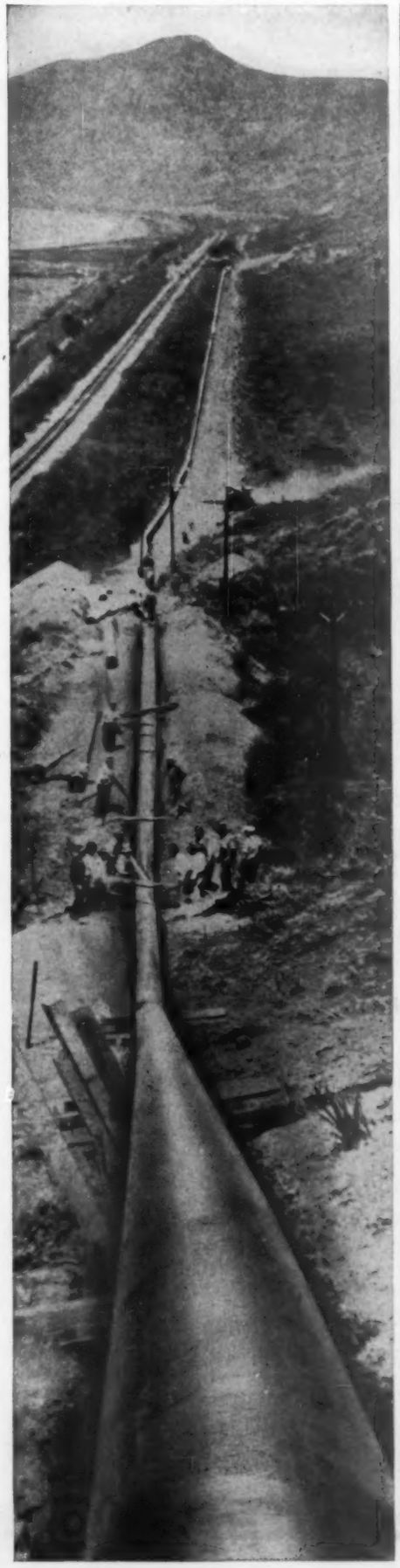
G-11239 Vertical adjustable cylinder inlet and outlet.

	Inlet	Outlet Swivel	Tapping
5 light	¾″	¾″	½″
5 light	1″	1″	½″
5 light	1″	1″	¾″
10 light	1″	1″	¾″
20 light	1¼″	1¼″	1″
30 light	1½″	1½″	1¼″

MUELLER

Trade-mark Reg. U. S. Pat. Office

Dependable Gas Brass Since 1857



OXY-ACETYLENE WELDING LOWERS COST

Linde Process Service maintains high standards of pipe line construction at

NEW LOW COST LEVELS

ACCURATE comparative cost figures were compiled on a recently laid Louisiana pipe line. A saving of approximately 50 per cent. in welding cost was indicated for oxy-acetylene welding by the new Lindeweld process, under Procedure Control.

Why?

The method used is a revolutionary recent development which makes for maximum speed, economy and dependability. On hundreds of miles of pipe line Lindewelding has demonstrated its ability to save from 30 per cent. to 60 per cent. in welding time and to reduce materially the consumption of gases and welding rod.

Lines laid by this new method of oxy-acetylene welding have been subjected to every conceivable test of construction and operation. They have proved dependable under all conditions. The joints are strong, permanently tight and tough. Under Linde Process Service pipe line construction by this new method of welding may be undertaken with the same confidence in a satisfactory result as older methods, and with further assurance of increased economy and speed.

Ask any Linde District Office for complete information on LINDEWELDING.

THE LINDE AIR PRODUCTS COMPANY

Unit of Union Carbide and Carbon Corporation

126 Producing Plants UCC 627 Warehouse Stocks

IN CANADA, DOMINION OXYGEN COMPANY, LTD., TORONTO

District Offices

Atlanta	Detroit	New York
Baltimore	El Paso	Philadelphia
Birmingham	Houston	Pittsburgh
Boston	Indianapolis	St. Louis
Buffalo	Kansas City	Salt Lake City
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Denver	Minneapolis	Tulsa
	New Orleans	

LINDE OXYGEN · PREST-O-LITE ACETYLENE · OXWELD APPARATUS AND SUPPLIES · UNION CARBIDE

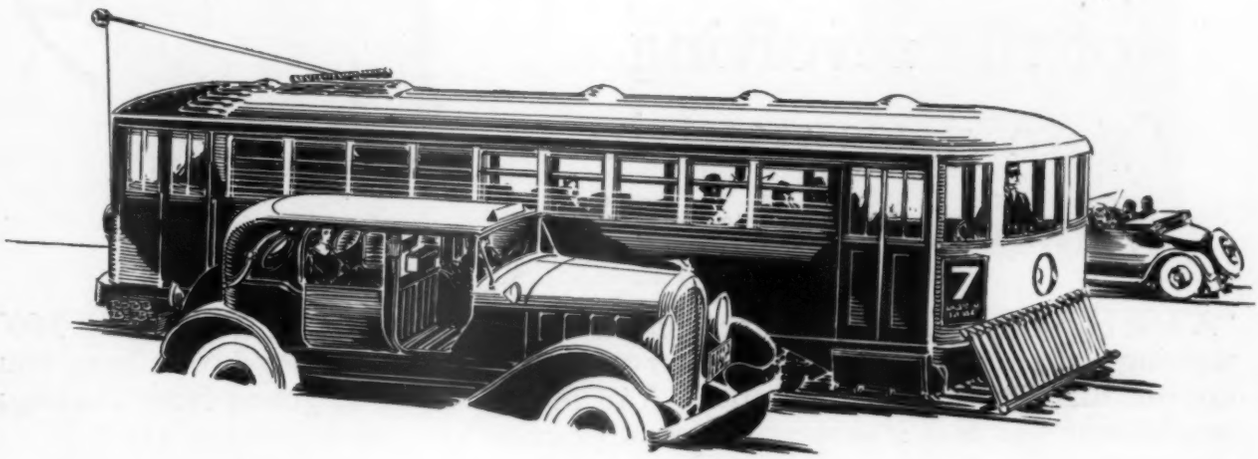
In 1854 *Nashville laid cast iron gas mains that are still in service*

SEVEN years before the Civil War, cast iron gas mains were installed in Nashville. Trolley cars, taxi cabs and motor trucks were then unheard of. Yet those cast iron mains, laid without benefit of the engineering precautions of today against electrolysis, traffic shock and vibration, are still down and rendering satisfactory service. Such testimony as this to the enduring quality of cast iron pipe is not exceptional. In more than 70 per cent of the 44 largest cities in America, *original* cast iron gas mains are still in use.

Evidence that cast iron has unequalled longevity engineers no longer require. The fact is conceded. But the ability of cast iron pipe to cope with unforeseen stresses and conditions has also been demonstrated by the still-in-service records of 70, 80, 90 and 100-year old mains. To realize this fully, contrast the radically changed conditions in modern cities with those in stage coach days—the complex maze of underground structures, dynamic traffic shocks, vibration and electrolysis.

Today, gas distribution engineers are provided with a still better product in modern mains of cast iron. With higher quality, greater uniformity of quality, and the development of efficient mechanical joints for high-pressure distribution, cast iron pipe meets the modern demands of gas distribution on a progressive plane of service.

TODAY *engineers are provided with a still better product in modern mains of Cast Iron*



For information regarding the advantages of cast iron pipe for gas distribution service, or for water and sewer mains, address Thomas F. Wolfe, Research Engineer, The Cast Iron Pipe Research Association, 309 Peoples Gas Building, Chicago, Ill.

Cast iron pipe bearing the "Q-check" trademark is obtainable from the following leading pipe founders: Alabama Pipe Company, Anniston, Ala.; American Cast Iron Pipe Company, Birmingham, Ala.; James B. Clow & Sons, 219 N. Talman Avenue, Chicago, Ill.; Donaldson Iron Company, Emaus, Pa.; Glamorgan Pipe and Foundry Company, Lynchburg, Va.; Lynchburg Foundry Company, Lynchburg, Va.; National Cast Iron Pipe Company, Birmingham, Ala.; United States Pipe and Foundry Company, Burlington, N. J.; Warren Foundry and Pipe Corporation, 11 Broadway, New York.

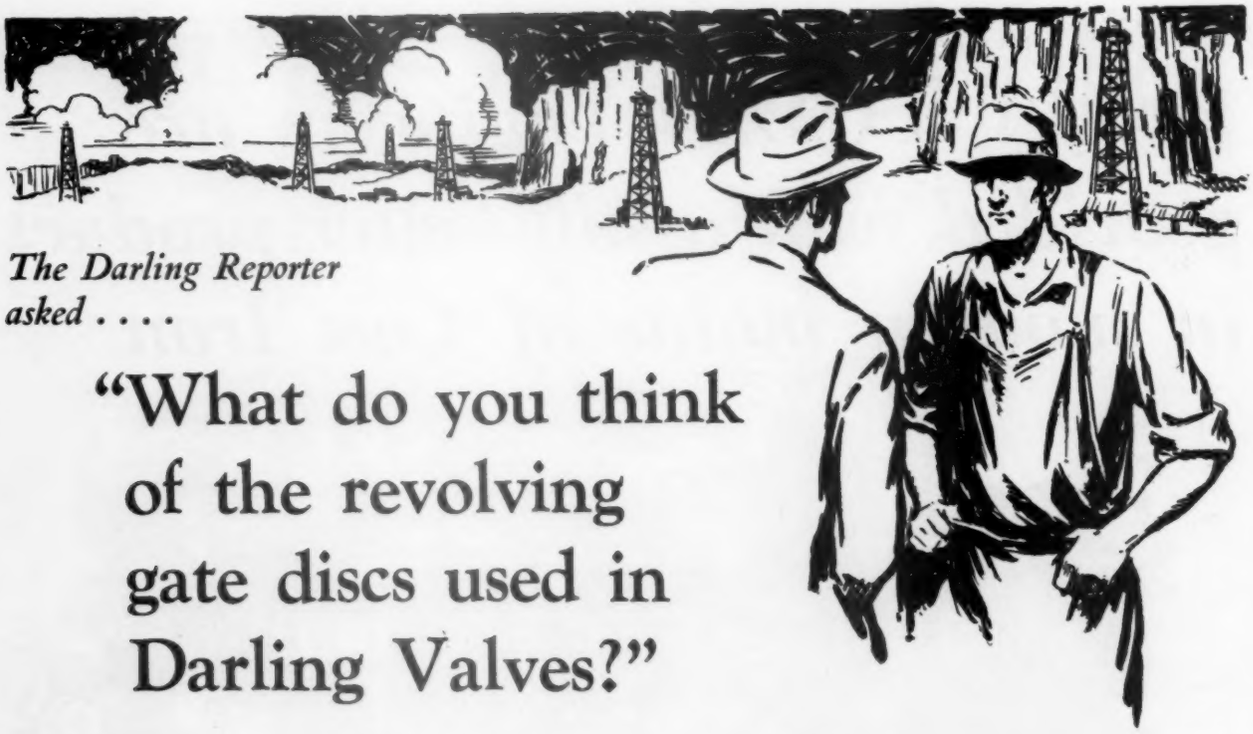
Efficient mechanical joints for cast iron gas mains are now in use and obtainable for high-pressure gas distribution.

Reg. Trade Mark

CAST Q IRON

The "Q-check" symbol shown above is the registered trademark of The Cast Iron Pipe Research Association.

CAST IRON PIPE



The Darling Reporter asked . . . .

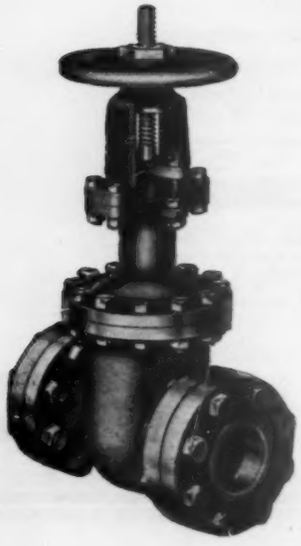
"What do you think of the revolving gate discs used in Darling Valves?"

"A first class idea. There's no question but that distributing the wear over a 360° wearing surface makes Darlings tighter and makes them last longer. At least, you can put that down as our thoughts. And the service we've gotten from Darlings would bear out that statement in actual practice."

The parallel seats and revolving gate discs, that seat in a new position at each closing, are an exclusive Darling feature.

Many other factors are equally important. For instance, the unusually high quality of the metals used in Darling Valve construction and Dar-a-loy trimmings—the careful workmanship, inspections and tests–are factors that insure long and satisfactory service from Darling Gate Valves.

Complete details gladly sent on request.



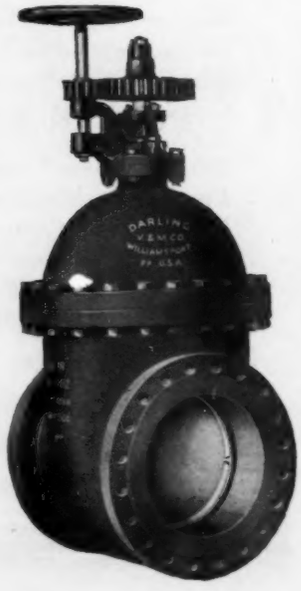
Darling Outside Screw and Yoke Semi-Steel Flanged End Gate Valve with companion flanges bolted on. Dar-a-loy trimmed.

DARLING GATE VALVES

Darling Valve & Mfg. Co.

WILLIAMSPORT, PA.

NEW YORK OKLAHOMA CITY HOUSTON



Darval Semi-Steel Gate Valve, Dar-a-loy trimmed — for natural gas pipe lines and compressor stations.

This "Pier Test" *speaks for itself*

This Pier *"failed"* at 2350°F

-while-

This Pier was *"still* good" at 2700°F

These tests were conducted at the same time and under exactly the same conditions: Pressure 25 lbs. per sq. inch, and a temperature raise of 400° per hour.

This Pier was laid with Joints of Fire Clay base Cement

This Pier was laid with Joints of KROMEPATCH Cement
THE MULTI-BOND CHROME CEMENT

The low fusion point of fire-clay base cement, resulted in its squeezing-out, bubbling and fluxing adjacent sides of brick.

Instead of acting as a "Bond," this cement allowed the brick to slip, crack and break.

KROMEPATCH joints showed no sign of fluxing, or squeezing-out, at a temperature 350° higher than the fluxing point of the fire-clay base cement.

KROMEPATCH joints "bond" the brick firmly in place, preventing cracking and breaking.

Isn't this "convincing proof" that KROMEPATCH will "save you" time, money and trouble? Remember, KROMEPATCH is the highest grade Refractory Chrome Ore — "properly prepared." It is shipped "dry" in steel containers of 200 lbs. Net. Wt.—212 lbs. Gross Wt.

Write for Bulletin No. 1-17-15

Distributors in Principal Cities

E. J. LAVINO AND COMPANY

REFRACTORIES DIVISION

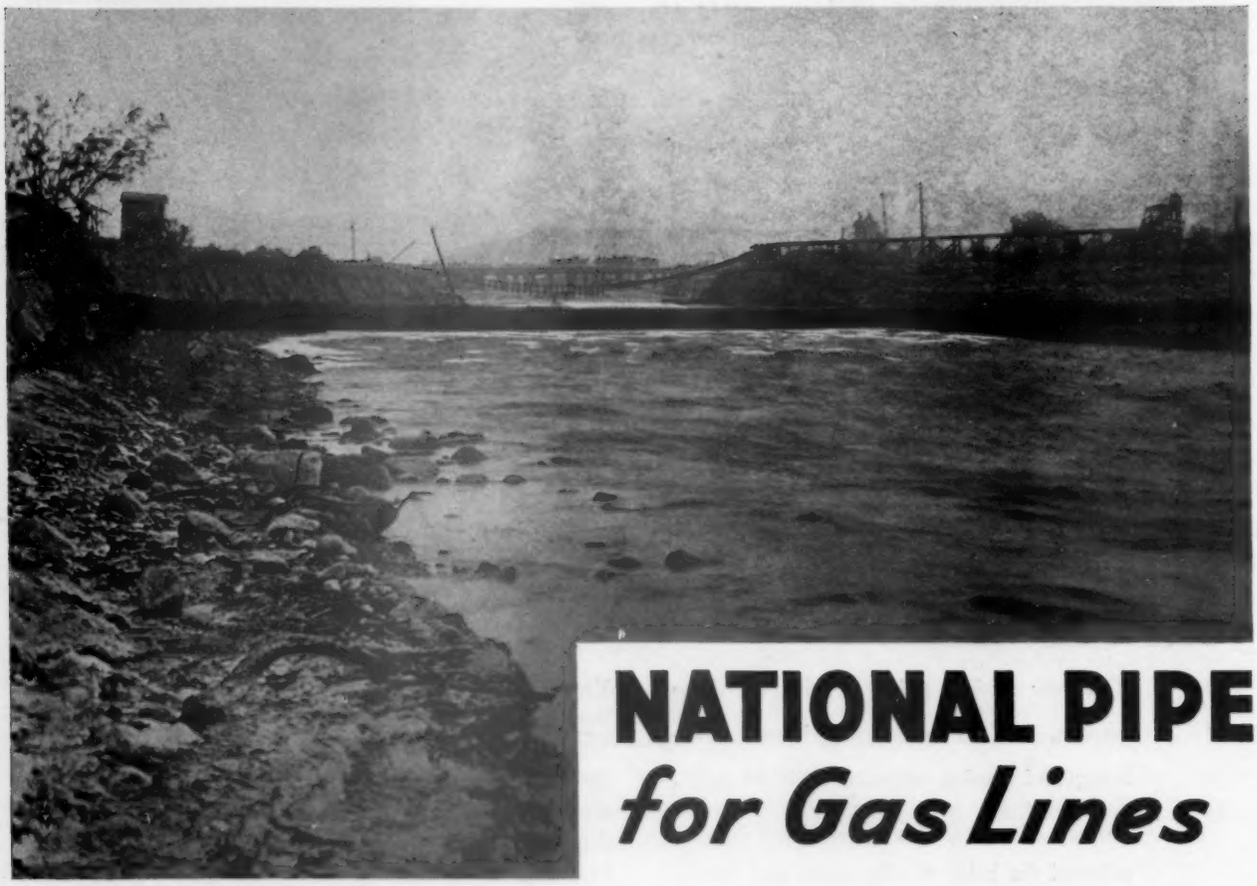
CHROME, MAGNESITE AND SILICA REFRACTORIES

BULLITT BUILDING PHILADELPHIA

"Lay your Fire Brick in KROMEPATCH"
THE MULTI-BOND CHROME CEMENT

ANSWERING THE QUESTION

"is it durable?"



NATIONAL PIPE *for Gas Lines*

A NATIONAL Pipe line across a flood-swollen river became a tubular bridge without intention. Yesterday well buried below the stream, today the line was not only unsupported from shore to shore but exposed to the force of the current and the impact of timbers and other floating objects until the flood subsided. No engineer would recommend imposing such a test on NATIONAL Pipe or any other pipe. But the fact that on occasion it has withstood the most abnormal strains, gives added assurance of the trustworthiness of NATIONAL Pipe for all conditions that are likely to affect it in practically any service. Stamina, among other qualities, proved through many years has made NATIONAL in the gas fields as elsewhere—

America's Standard Wrought Pipe

NATIONAL TUBE COMPANY

Frick Building, Pittsburgh, Pa.

SUBSIDIARY OF UNITED STATES STEEL CORPORATION

PRINCIPAL SUBSIDIARY MANUFACTURING COMPANIES

American Bridge Company
American Sheet and Tin Plate Company
American Steel and Wire Company
Carnegie Steel Company
Columbia Steel Company
Cyclone Fence Company
Federal Shipbuilding and Dry Dock Company
Illinois Steel Company
Minnesota Steel Company
National Tube Company
Oil Well Supply Company
The Lorain Steel Company
Tennessee Coal, Iron & R. R. Company
Universal Atlas Cement Company

Pacific Coast Distributors—Columbia Steel Company, Russ Building, San Francisco, Calif. *Export Distributors*—United States Steel Products Company, 30 Church Street, New York, N. Y.

LIQUEFIED PETROLEUM GASES

PROPANE . . . . BUTANE . . . . PENTANE

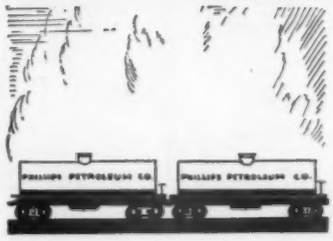
Philfuels Company's sole business is the manufacture, transportation and utilization of liquefied petroleum gases—and the fact that Philfuels, alone, accounted for approximately 50% of all liquefied petroleum gas sold in the United States during 1930 bespeaks its position in the industry and its ability to serve your needs.

Unfailing Source of Supply

Philfuels' parent company, Phillips Petroleum, the world's largest manufacturer of natural gasoline—insuring an unfailing source of liquefied petroleum gas.

Adequate Storage Facilities

Millions of gallons of liquefied gas storage assures Philfuels ability to supply any desired quantity—from a single cylinder to a trainload.



LargestTransportationSystem

The largest fleet of liquefied petroleum gas tank cars in existence is operated by Philfuels—your guarantee of prompt and dependable delivery.

Unexcelled Experience

The rich experience gained in the development and utilization of these gases is an additional advantage which Philfuels offers to its customers.

Philfuels engineering and research facilities are available to the Gas Industry for the solution of utilization problems—and an opportunity to demonstrate Philfuels ability to serve, will be welcomed.

GAS MANUFACTURING DIVISION

« PHILFUELS COMPANY »

(Subsidiary of Phillips Petroleum Company)

7-101 GENERAL MOTORS BUILDING

DETROIT - - - MICHIGAN

It's McWANE FOR THE *REAL* JOBS

"Hadn't we better get McWANE Pipe for *that* job?" is the question being asked these days when a piece of tough service like this bridge job looms ahead.

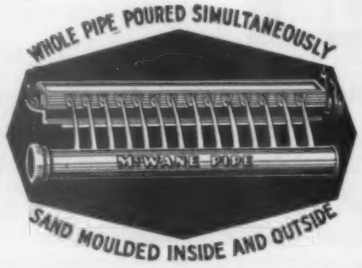
McWane cast iron gas pipe won that preference through sheer performance. The many outstanding gas men that use it know that it has reasons for its goodness: that it combines the virtues of time-tried sand-cast pipe (McWane is sand-cast) with the refinements and extra strength of modernness.

Over 30,000 lbs. tensile strength, for example. Yet a soft, dense-grained, gray iron: cuts, taps, handles beautifully. And a size—and joint—for every pressure. Long, strong, straight, and uniform.

SMALL SIZES *for* HIGH PRESSURES

McWane small cast iron pipe—rustproof and everlasting—needs no coating or coddling. McWane recess-threaded joints (without couplings) hold any pressure the pipe will. Other types of joints, too. The surest, simplest pipe you can lay. As small as 1¼ and 2 inches. "At least find out"—by writing for new booklet.

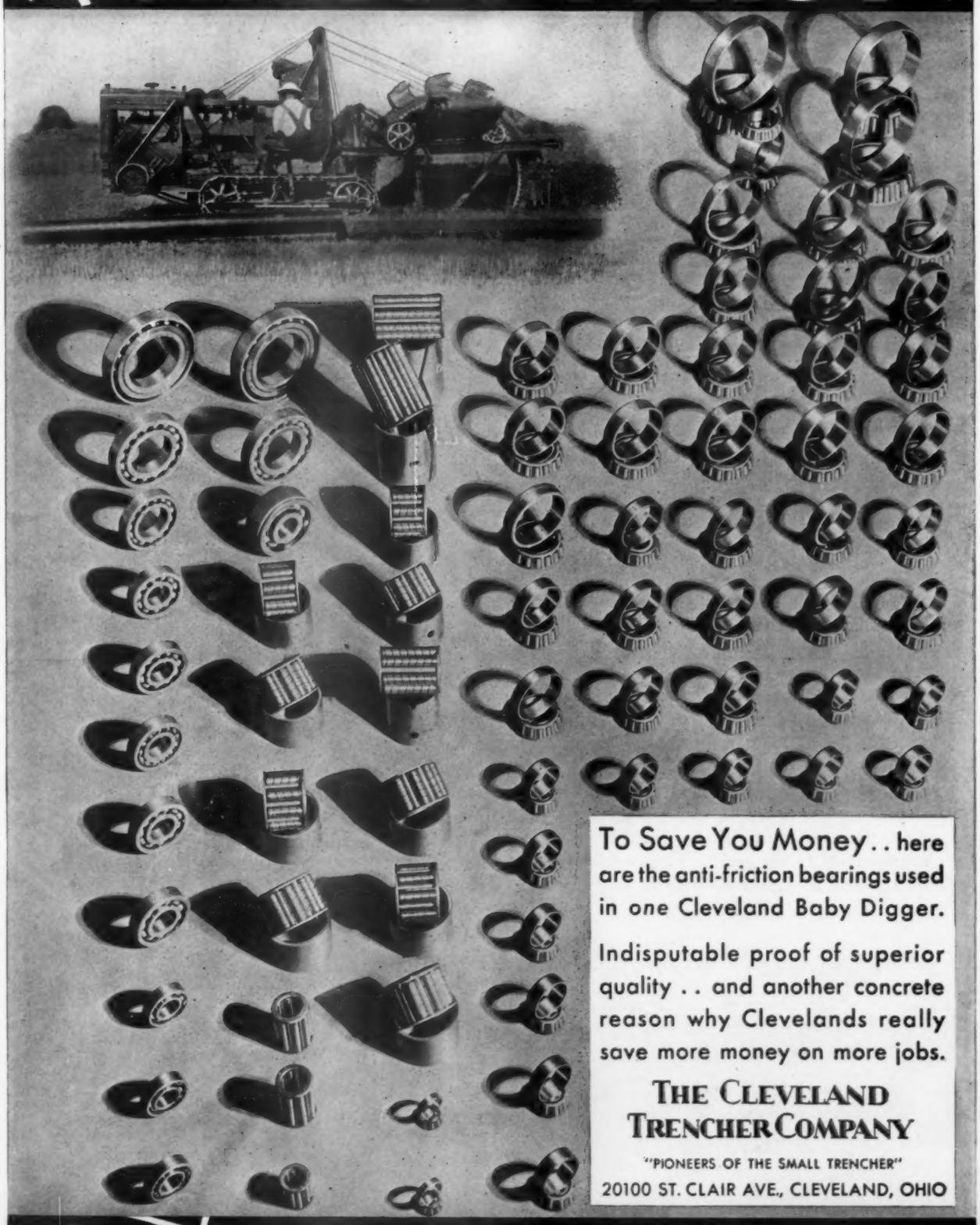
McWANE CAST IRON PIPE CO. BIRMINGHAM ALABAMA



PACIFIC STATES CAST IRON PIPE CO. PROVO, UTAH

208 S. LaSalle Street CHICAGO — 149 W. 2nd South Street SALT LAKE CITY — 40 Exchange Place NEW YORK — 111 Sutter Street SAN FRANCISCO — 417 S. Hill Street LOS ANGELES
226 Continental Oil Bldg., DENVER
1006 Grand Avenue, KANSAS CITY
611 Spalding Bldg., PORTLAND, ORE.
1807 Santa Fe Bldg., DALLAS

QUALITY FIRST!



To Save You Money . . here are the anti-friction bearings used in one Cleveland Baby Digger.

Indisputable proof of superior quality . . and another concrete reason why Clevelands really save more money on more jobs.

THE CLEVELAND TRENCHER COMPANY

"PIONEERS OF THE SMALL TRENCHER"

20100 ST. CLAIR AVE., CLEVELAND, OHIO

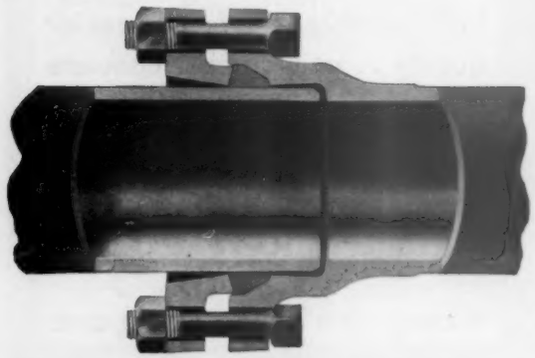
The CLEVELAND BABY DIGGER

DOUBLEX SIMPLEX CAST IRON PIPE

is *Quickly* EASILY ECONOMICALLY LAID

Connecting up Doublex Simplex Pipe on trench side preparatory to "snaking in" for natural gas in Ohio.

DUE to the long lengths in which it is furnished (16 feet) and the unique design of the joint, Doublex Simplex Pipe can be quickly, economically laid and the joint completed using one tool—a ratchet wrench. When the plain end of a Doublex Simplex Pipe is socketed into the flange end (see cross-section diagram) a triangular stuffing box is formed with a shoulder against which a ring gasket is compressed by the "loose flange" as the bolts are tightened. The gasket naturally wedges into the stuffing box of the joint and its bulk eliminates rigidity. Deflection in any direction is automatically permitted, and the deep socket allows plenty of room for longitudinal expansion or contraction of the line. A new, comprehensive illustrated catalog describing Doublex Simplex Pipe will be sent you *free* on request. Address Acipco office nearest you.



DOUBLEX SIMPLEX JOINT
withstands high pressures and remains bottle-tight under repeated deflections.

AMERICAN CAST IRON PIPE COMPANY

BIRMINGHAM, ALA.

SAN FRANCISCO
DALLAS
NEW YORK CITY
CHICAGO
SEATTLE
MINNEAPOLIS
KANSAS CITY
LOS ANGELES
CLEVELAND

319G

For Line after Line
DRESSER
COUPLINGS Dominate!
The major lines for 1931 . . . Dresser Couplings are coupling them. Leaders in the Gas Industry recognize Dressers as the best means of joining pipe. Flexible under every twist or shift of the line; permanently tight as long as the pipe stays in service.
S. R. DRESSER MANUFACTURING COMPANY, BRADFORD, PA.

Have You Received
Your Copy of
Our New No. 16 Catalog?

SPRAGUE METERS

and

Sprague Regulators

Accurate Pilot Measurement
Accurate Volume Measurement

Satisfactory
Maintenance cost, first cost, and general results in Manufactured or Natural Gases, High or Low Pressure

SPRAGUE METER CO.
BRIDGEPORT, CONN.

REYNOLDS

Low pressure regulators assure you of consistent delivery pressure for combustion purposes. This is true regardless of varying line pressure and uneven volumes. These low pressure regulators are designed and built to handle specific jobs. Before specifying your gas control units investigate by comparison the superiority of Reynolds Low Pressure Regulators.

FURNACE INSTALLATIONS

In these types of installations sensitivity, dependability and accuracy in regulating delivery pressure are the governing factors which make the job an object of pride or just an installation. The furnace type low pressure regulators are guaranteed to operate with a performance not to be excelled by anything else on the market. Study the cross-sectional view—note the rugged construction—compare opening and closing limits with that of any other.

REYNOLDS PRODUCTS

for all kinds of Pressure Reductions— for either Artificial or Natural Gas

GOVERNORS—
- Intermediate Pressure
- Triple Outlet
- Holder
- Toggle Type Street

REGULATORS—
- High Pressure Service
- Low Pressure Service
- Intermediate Pressure
- High Pressure Line
- Single and Double District Station

VALVES—
- Automatic Quick Closing Anti-Vacuum
- Relief

SEALS—
- Mercury
- Dead Weight

SERVICE.. Reynolds units are factory tested for maximum performance through a complete range of load capacities. They are guaranteed to successfully handle the job they are specified for, when properly installed. Also, Reynolds Engineering Staff is always ready to help solve or work out any gas control problem. Write us, our branch offices or our representatives for further details.

RECOGNIZED GAS CONTROL SINCE 1892

REYNOLDS GAS REGULATOR COMPANY

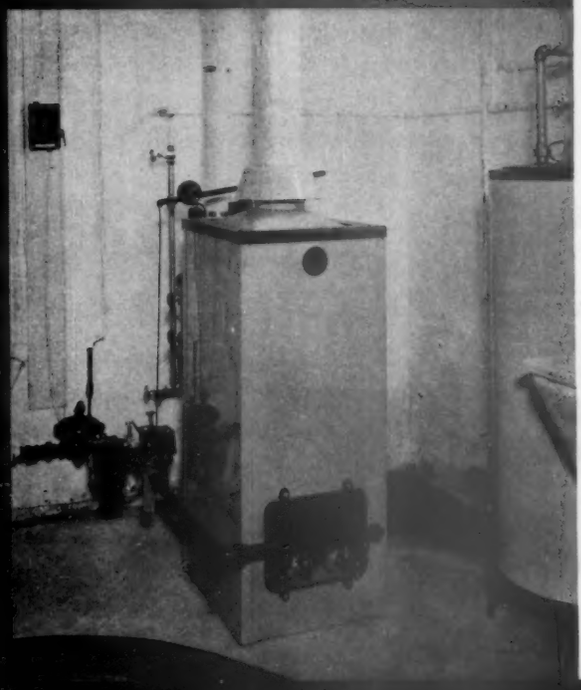
ANDERSON, INDIANA

REYNOLDS BRANCH OFFICES { 2nd Unit, Santa Fe Building, San Antonio, Texas
422 Dwight Building, Kansas City, Missouri

REPRESENTATIVES:

EASTERN SERVICE CO., Boston, Massachusetts • F. E. NEWBERRY, Avon, New Jersey

1200 IDEAL GAS BOILERS



Mezick Homes, Inc. . . . Rodman & English . . . Long Island Housing Corporation select Ideal Gas Boilers as standard equipment on three projects totaling 1200 Homes.

New York & Queens Gas Company, affiliated with the Consolidated Gas Company of New York, estimates that on the completion of these three projects their load will be increased 252 million cu. ft.

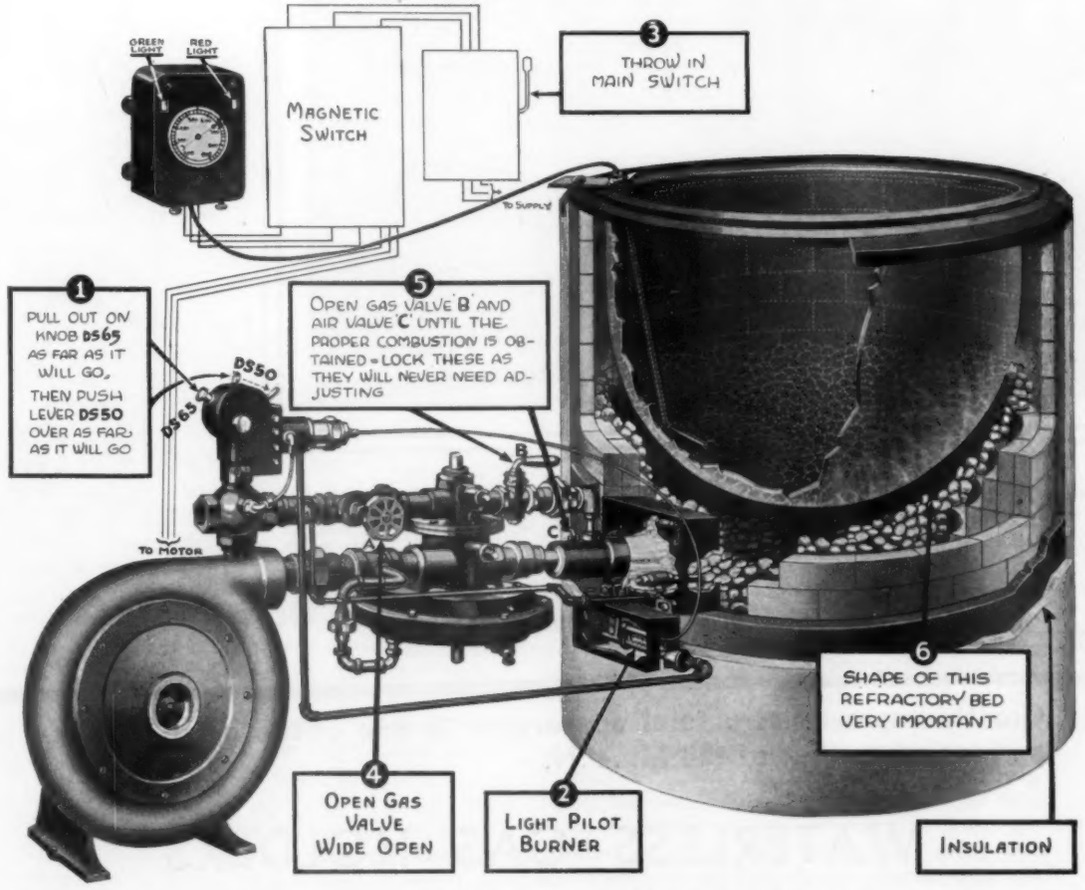
1200 LONG ISLAND HOMES

AMERICAN GAS PRODUCTS CORPORATION

Chrysler Building, New York

A DIVISION OF AMERICAN RADIATOR COMPANY

400,000 LBS. in 16 HOURS
OR 25,000 LBS. PER HOUR


GREEN LIGHT
RED LIGHT
MAGNETIC SWITCH
3 THROW IN MAIN SWITCH
TO SUPPLY
1 PULL OUT ON KNOB DS65 AS FAR AS IT WILL GO, THEN PUSH LEVER DS50 OVER AS FAR AS IT WILL GO
DS50
DS65
5 OPEN GAS VALVE 'B' AND AIR VALVE 'C' UNTIL THE PROPER COMBUSTION IS OBTAINED - LOCK THESE AS THEY WILL NEVER NEED ADJUSTING
B
C
TO MOTOR
6 SHAPE OF THIS REFRACTORY BED VERY IMPORTANT
4 OPEN GAS VALVE WIDE OPEN
2 LIGHT PILOT BURNER
INSULATION

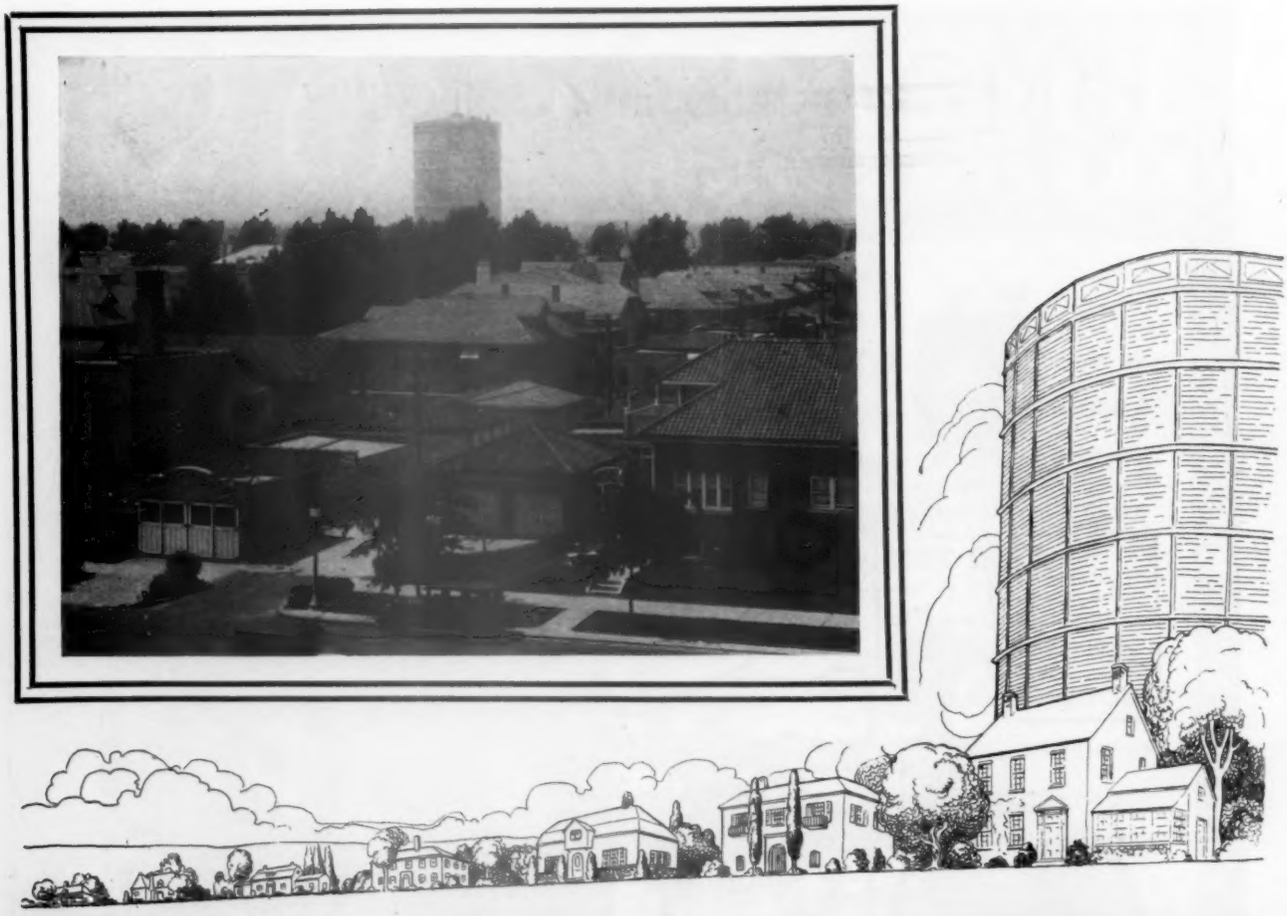
That's the performance of Partlow Automatic Gas Burning Equipment in the Hose Department of one of the large rubber companies. It served a lead melting pot of 20 tons capacity. Speed of melting makes possible this enormous daily capacity in two 8-hour shifts.

Many economies are engineered into Partlow Equipment such as savings of metal, attending labor and gas consumption. All the air that is necessary for complete combustion is entrained as primary air through the burner itself. Flue and stack temperature are also minimized.

In Automatic Gas Burning Equipment you will find a Partlow design of the speed and capacity for practically every size metal melting pot. Partlow Automatic Gas Burning Equipment has the added feature of a Safety Pilot which automatically shuts off all gas in case of any interruption in the gas main or if the pilot should become extinguished. There's one sure way to gain the greatest economy in soft metal melting. Send your inquiries to Partlow.

Write or wire us for list of enthusiastic users.

The Partlow Corporation - New Hartford, N. Y.



Greatly improved structural appearance is one of the decidedly important advantages of the M. A .N.

WATERLESS GAS HOLDERS

built exclusively in this country by the Bartlett Hayward Co.

There is no submergence of any metal in water or in paint-discoloring and paint-destroying oils with resultant corrosion and discoloration of shell and tank as with the water-seal type of holder.

In contrast the Waterless Gas Holder can be painted with greater durability and more permanently harmonious with its surroundings, or by a well planned combination of shades of color can be made to blend with the skyline.

It is becoming increasingly more important to give serious consideration to this phase of civic pride.

THE BARTLETT HAYWARD COMPANY

BALTIMORE **MARYLAND**

Coal Gas, Carburetted Water Gas, Blue Water Gas, By-Product Plants—DeBrouwer Charging and Discharging Machines—Waste Heat Boilers—Purifiers—Condensers—Tar Extractors—Thickening and Filtering Equipment—Feld Scrubbers—Fast's Couplings—Tanks—Gas Holders

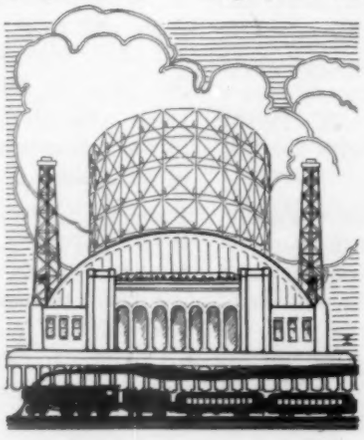
AMERICAN
GAS JOURNAL
Established 1859 Pioneer of the Gas Industry
Manufactured and Natural Gas

HENRY M. RILEY, *Editor*

Convention Time Draws Near

WITH CONVENTION TIME in the offing it is to be hoped that but few gas companies will pursue a policy that has as its object the sending of a rock-bottom, minimum number of men to the meeting in Atlantic City. Such a procedure would seem to be entirely uncalled for. Statistics lead one to feel that, at the worst, the attendance should not suffer more than two or three percent when compared to the 1930 record. Accordingly, there would not accrue any undue purse straining to close up this gap.

There are a number of reasons why this 1931 gathering of the gas clan should strive for a high, or at least normal attendance mark. First, we have been among those undertakings the least affected by the downward swing of business; next, our indispensable allies, the manufacturers of appliances and equipment, have done yeoman work in contracting for exhibit space; also, a healthy attendance would unquestionably have a heartening effect on the tone of business in general and lastly, it would add to the morale of the gas industry itself.



If any gas company feels the necessity of paring down on expenses of this character, the same should be done only as a last resort, and, always with the idea of drawing a line midway between liberalism and conservatism. Assuming you sent six men to the 1930 meeting and plan to reduce this number to four this fall, see if you cannot squeeze in the other two by way of cutting some other company expense. Perhaps you might reduce those social gatherings held throughout the year from five to four meetings. Or, you might send the men on a part time plan. At any rate, endeavor to get a strangle hold on conservatism by way of appropriating the same amount of money for convention expenses as obtained last year; maneuver to the end that you will do your utmost to insure a good attendance.

The annual meeting of American Gas Association is a call to the colors of all forward looking gas men. It supplies the sinew for carrying on and has contributed largely to the ability of the gas industry to keep up its record of over a hundred years of success in all of its endeavors. *Ergo,* this 1931 meeting's got to click.

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September 1931

As We See It

The Hearth Fires Will Soon Glow

WITH THE APPROACH of Autumn there comes to mind the closing of doors and windows in the cool of the evening and the gathering of the family around the crackling logs in the fire place. There are those who will argue as to the peculiar virtues of hickory and oak faggots as compared to chestnut and pine. But, to present the seamy side, the housewife will have to contend with ashes in the morning, regardless of the variety of wood used, and the paterfamilias will have to unfatten his purse to the extent of about twenty-five dollars per cord, regardless of its rate of burning or its heat-giving qualities.

Many homes boasting of fire places consume a cord of wood per month, which, as stated, demands the expenditure of about twenty-five dollars—and the attendant dirt and bother. For twenty-five dollars one can buy twenty-five thousand cubic feet of gas, at one dollar per thousand. An attractive, *heat-giving* gas fire place heater, at fifty cubic feet per hour and three hours per evening will cost less than five dollars per month to operate—and the ashes will be nil and Elmer won't be scared by spiders when he goes to the cellar to lug up firewood; gas pipes will do this chore for Elmer.

Let's sell more fire place heaters.

"Muscling In" Needed

PRELIMINARY ESTIMATES point to a fine prospective gas load in the air conditioning field, but it must be borne in mind that oil, steam and electricity can be substituted for gas in this relatively new branch of supplying bodily comfort. Indeed, a number of oil fired air conditioning apparatus are already in use. Accordingly, the business will not come to us unsolicited; we've got to "muscle in" with well laid plans and selling energy.

Any sound working plan calls for a painstaking survey. There must be compiled accurate statistics on the size and number of business buildings that could be induced to install air conditioning, as well as those residences in the upper bracket. A regular visit to the building inspector's office will supply much of this information with a minimum expenditure of time. In addition, statistics of this nature could be culled on homes and buildings already built; a definite number set as a goal for each month.

A study of the local income tax figures would be splendid in giving one a line on the possible number of home customers for air conditioning; basing this figure on the number reporting incomes on a predetermined minimum yearly salary. The adaptability of the average home to air conditioning should be investigated and recorded, as well as the cost of installation in such a case.

With the return of business it is not at all impossible that air conditioning might catch hold at a truly enormous rate, just as the auto and radio did. In this event we must be ready with a selling plan and be prepared to "muscle in" with determination.

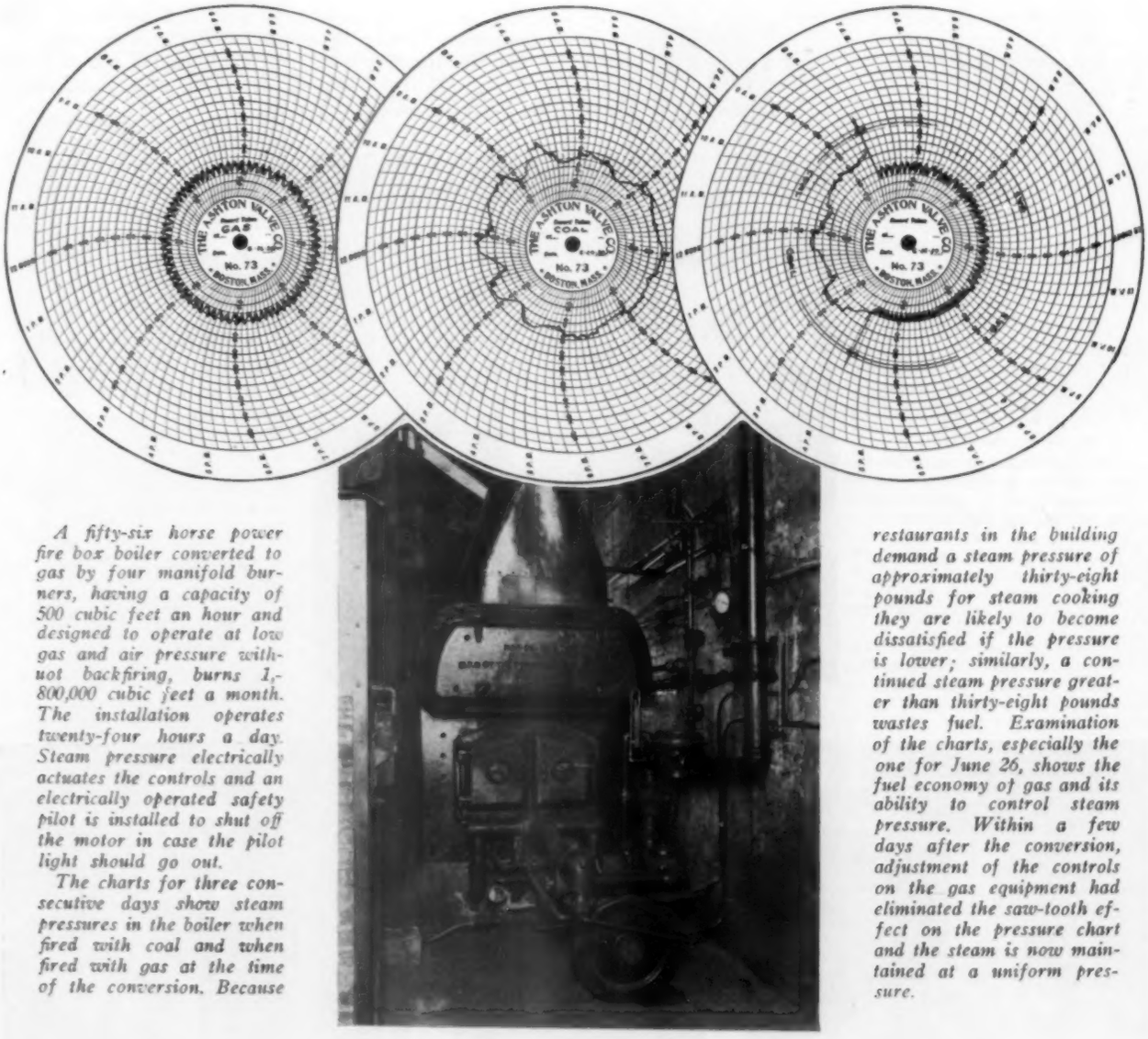
A Public Responsibility In Fixing of Rates

RATE MAKING is at best a difficult task both for utility executives and for supervisory public officials. Apparently in some cases the task has been complicated by the desire to offer to certain classes of customers an optional rate which now comes in for criticism in a specific case before the New York State Public Service Commission. That case arose because of the complaint on the part of certain customers of one of the New York electric companies that the bills rendered were higher for the given amount of service received by certain customers than for others who got the same amount of service during the same period.

The Commission has ruled that this billing amounted to discrimination, and that the rates were therefore illegal. It is especially emphasized that the company is obligated to treat all customers alike and hence bill them alike when receiving the same quantity and character of service.

There is no more serious charge made against a management than that it unfairly discriminates between customers of the same class. Such discrimination is rarely intended; never by wise executives. Hence it will be important for many to read the decision of the New York Public Service Commission in this case of the Long Island Lighting Company which was rendered late in July. Gas men as well as electric men will want to study and apply in their business the precautions suggested, in order that there may not be any ground for the charge of illegal discrimination.

All will note with perhaps the greatest interest the idea which is proposed by the Commission that a company cannot reasonably transfer the responsibility for choice between two rate schedules to its customers. This is an interesting point which apparently obligates the company to see that each customer secures the lowest bill which he might receive under any of the rate schedules which he might legitimately ask to have applied to his particular case. With the growing complexity of systems for billing customers for gas, this phase of the decision takes on special significance.



A fifty-six horse power fire box boiler converted to gas by four manifold burners, having a capacity of 500 cubic feet an hour and designed to operate at low gas and air pressure without backfiring, burns 1,800,000 cubic feet a month. The installation operates twenty-four hours a day. Steam pressure electrically actuates the controls and an electrically operated safety pilot is installed to shut off the motor in case the pilot light should go out.

The charts for three consecutive days show steam pressures in the boiler when fired with coal and when fired with gas at the time of the conversion. Because restaurants in the building demand a steam pressure of approximately thirty-eight pounds for steam cooking they are likely to become dissatisfied if the pressure is lower; similarly, a continued steam pressure greater than thirty-eight pounds wastes fuel. Examination of the charts, especially the one for June 26, shows the fuel economy of gas and its ability to control steam pressure. Within a few days after the conversion, adjustment of the controls on the gas equipment had eliminated the saw-tooth effect on the pressure chart and the steam is now maintained at a uniform pressure.

Off-Peak Rates Decrease Summer Valley

STAFF CORRESPONDENT

MANAGERS of large loop buildings and apartment buildings are enthusiastic about a new off-peak rate that has been in effect in Chicago since June 1st of this year. It is a large volume rate to fill the summer valley; therefore it is available only for water heating, steam generation, and space heating.

An innovation in off-peak gas rates has been included in this one: although the customer may use gas for no purpose other than the three specified, gas may be used the year round for any or all of these purposes. The off-peak feature is introduced by making a higher charge for gas during the peak months than during the valley months.

Most off-peak rates permit no gas at all to be used during the peak months. Such a clause often works a hardship on the customer, who is willing to pay a reasonable penalty for using gas when an emergency arises during the peak months. However, this new rate of The Peoples Gas Light and Coke Company permits the customer to use gas when and as wanted for water heating, steam generation, and space heating without endangering the off-peak feature of the contract.

During the sevens month from April to October, inclusive, the rate is six cents a therm for the first 260 therms and five cents a therm for all in excess of the initial 260. During the five peak months from November to March, inclusive, the rate is twenty-five cents a therm for the first 130 therms and twenty cents a therm for all in excess of the initial 130 therms.

At least three of a customer's monthly bills in the six months from May to October, inclusive, must be

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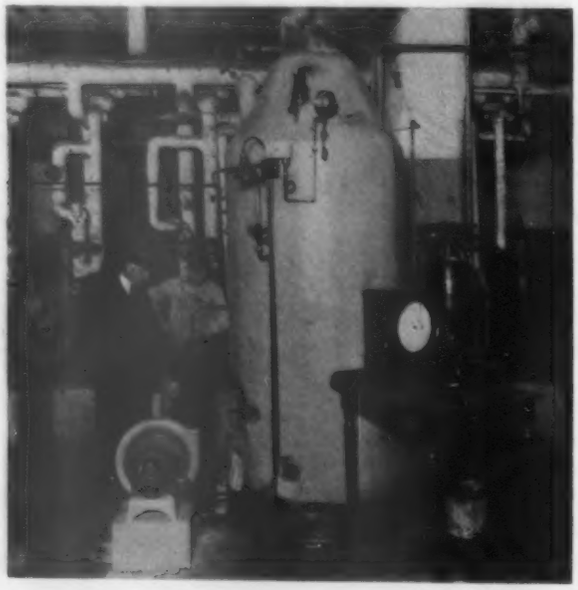
not less than fifty dollars each. If any of the three largest monthly bills during that six-month period is less than fifty dollars, then the aggregate sum by which any such bill is, or bills are, less than fifty dollars each is to be billed to the customer in November, in addition to the regular charge for gas used in November. This requirement is the only minimum charge in the rate.

The illustrations with their captions tell the story of some typical installations. In all of these installations the water is heated indirectly.



A twenty-two horse power vertical fire tube boiler was converted to gas with a two-valve control using standard suction tees. Number two arch brick were laid around the water leg to protect it and a spool was placed in front of the burners to obtain an intimate mixture of gas and air by increasing the turbulence.

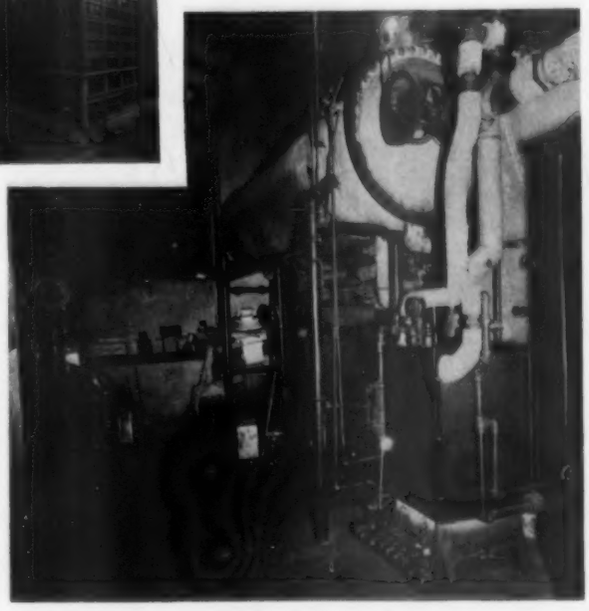
In order to increase the efficiency of the installation, three-eighths-inch chain restrictors were placed inside the fire tubes of the boiler. Controls are electric. The burner capacity is 2,000 cubic feet an hour; the gas used approximates 650,000 cubic feet of 530 B. t. u. gas, monthly.

A one hundred horse power water tube boiler was converted to gas operation by three nozzle-mixing burners entering the furnace through tunnels five feet long that were baffled to give turbulence to the gas flame and to improve combustion by providing a more intimate mixture of the gas and air. Thorough study and test of the installation during the first season's operation indicated that radiation losses were too high through the furnace walls and that the installation shown on the right would give greater efficiency.

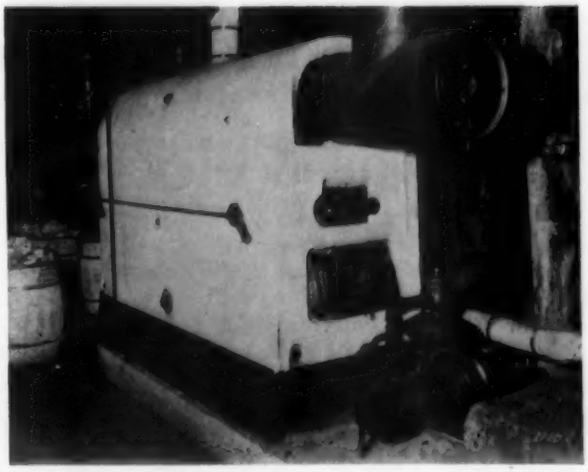
The original burners were removed, a curtain wall was put in to block off the furnace from the boiler so that excess air would be excluded and a target wall was built up opposite the new position for the burners. Then, two piloted end burners were put inside under the water tubes. The motor is controlled by steam pressure and pressure of the air from the blower opens the diaphragm valve that admits gas. The new installation effected a saving of twenty per cent in the volume of gas burned, despite an increase in the volume of water heated.

Although the boiler is coal fired during the winter, the gas burners are left in place by protecting them with the brick from the curtain wall when it is removed to permit coal firing.

In five months, the gas installation for this customer saved enough in total operating costs to pay for the gas installation. The equipment meets severe conditions in that the water must be at a temperature of 180 degrees Fahrenheit to satisfy the tenants—physicians, dentists, beauty shops, a barber shop, and two restaurants. When coal was used for fuel, never a day passed without one or more complaints about water temperature from tenants; but during the entire time that gas has been used to heat the water there has not been even one complaint.



This five horse power low pressure gas fired boiler displaced a seventy-five horse power coal fired boiler six years ago when the lowest rate available to the customer was seventy cents a thousand cubic feet for 530 B. t. u. gas. Even at this high rate, operating costs were reduced thirty-five dollars a month without any labor allowance. Gas flow to the burners is controlled by a thermostat in the storage tank; steam to the heat exchanger inside the storage tank is controlled by a steam regulated valve.



This combination "double end" steam boiler and rubbish burner was developed for the Chicago Loop area. Rubbish is burned at one end, the other end being only for gas fuel. The boiler is rated at eighteen horse power although the conversion burner installed has sufficient capacity to develop twenty-six horse power. Inasmuch as the average hourly gas burned for water heating, determined by twenty-four-hour tests, is only 372 cubic feet of 530 B. t. u. gas with a maximum hour of 450 cubic feet, the capacity of the gas installation specially developed for this type of boiler may seem to be far too great; however, the additional capacity was requested by the customer so that the boiler can be used for heating the building during the fringe of the heating season. Steam pressure controls the blower; air pressure from the blower operates the special diaphragm valve which shuts off the gas. Automatic draft balance is obtained by the floating butterfly damper.

Comparative Data for Typical Gas Fired Water Heating Installations in Chicago

Heating value of the gas, 530 British thermal units a cubic foot

Installation	Type of Boiler	Rentable Floor Space	Number of Floors	Duration of Use	Seasonal Cost Crude Fuel	Seasonal Cost Gas	Net Saving
A	100 H. P. Horizontal	72,000 sq. ft.	12	5.0 mos.	$1,980.84	$904.16	$1,076.68
B	25 H. P. Vertical	310,000 sq. ft.	22	4.3 mos.	1,766.45	872.65	893.80
C	20 H. P. Vertical	180,000 sq. ft.	20	5.0 mos.	1,337.50	886.74	450.76
D	56 H. P. Fire Box	190,000 sq. ft.	17	3.3 mos.	2,597.91	2,023.21	574.70
E	300 H. P. Scotch Marine	425,000 sq. ft.	21	3.3 mos.	1,829.75	1,773.77	55.98
F	12-S-43	50,000 sq. ft.	15	2.67 mos.	680.40	313.16	367.24
G	2 No. 4GS-12	142,000 sq. ft.	26	5.0 mos.	1,037.50	765.00	272.50
				Average.....4.08 mos.	$1,604.34	$1,076.96	$527.38

Natural Gas To Manufacture Weather

ONE of the largest potential and most rapidly developing new markets for natural gas is in "weather manufacture" or artificial refrigeration other than for food preservation, according to the current bulletin issued by Appalachian Gas Corporation. "This science, even in its present infant stage, is already saving American industry over $15,000,000 annually," says the article.

"The need for artificial refrigeration, whether for personal comfort in theatres, office buildings or restaurants, or in industrial establishments such as knitting mills where regulated temperature boosts output by reducing any breakage, is becoming daily more apparent," continues the bulletin. "Executives who have inquired into installation costs are generally under the impression that operating charges are higher than they actually are; in fact such costs are almost trivial. Coupled with the improvements which are constantly being introduced, it is safe to assume that the next two years will witness a great impetus in the artificial refrigeration industry which is bound to be reflected in increased gas sales, gas being the most convenient medium for use in absorption-process cooling.

"But the future of artificial refrigeration is not confined to commercial plants and public buildings, as it is only a matter of time before the gas-activated cooling system will become standard equipment in homes and apartment houses. The committee on industrial gas research of the American Gas Association has voted a $15,000 appropriation for three experimental installations of house cooling systems, which indicates that progress in this development is nearing its final stages. Home cooling by gas is extremely important to natural gas companies, because of its effect on the Summer load valley, and particularly in the South because of large potential sales."

A New Method for the Determination of Gas Velocities

F. BOSSNER
Director Engineer, Vienna-Simmering

IN a report on apparatus for measuring volumes of gas, steam and liquids (see this paper 1929, vol. 12, p. 215), Engineer Kolar has described a method which, at my suggestion, was first tried out on November 28, 1928, in the Simmering Gas Works, and which, since that time, has rendered us good service on many occasions. The method which is based upon the addition to the gas whose volume is to be measured of an easily detectable gas is not identical with the so-called "Injection Method." In the latter method a constant and known volume of a foreign gas, which permits of accurate determination, (such as ammonia, sulphur dioxide or carbon dioxide) is added at a uniform rate and during a definite time interval to the gas which is to be measured.

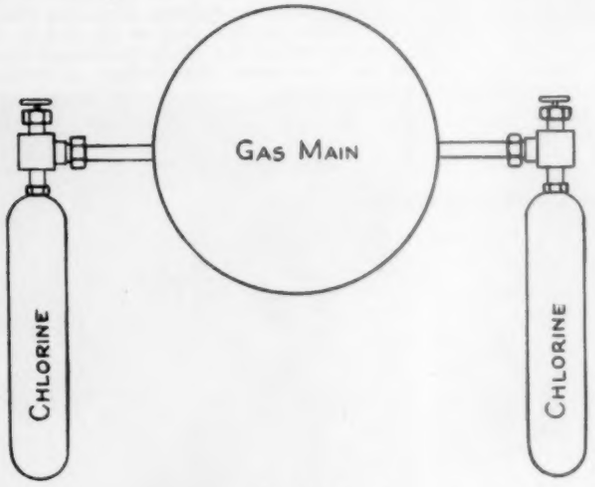


Figure 1

An immediate analytical determination of the gas which has been injected permits one to calculate the volume of the gas which is being measured from the extent of dilution of the gas which has been added. The procedure is, however, indirect, requires a long time, and borders on the laborious, since it is necessary to add the gas, which is to be injected, constantly and in exact and equal quantities, and also because of the large conversion factor, since one is able to add the injected gas only in comparatively small volumes. Also, doubts may arise as to whether or not the injected gas may have been consumed in part by chemical reactions, absorption, or condensation.

In opposition to the aforementioned method, the method which we call the "Gas Shot Method" requires only a qualitative determination of the gas which has been added and the measurement of the time interval by means of a stop watch. The principle involved is that we utilize chlorine (from high pressure tanks) as the gas for the "shot." This gas can be readily determined by means of potassium iodide starch solution or paper even at a dilution of 0.005% or 0.143 mg. per liter through the instantaneous blue coloration imparted to the starch. For example see "The Gas Mask" 1930, Vol. II, which contains data which agrees with our preliminary tests.

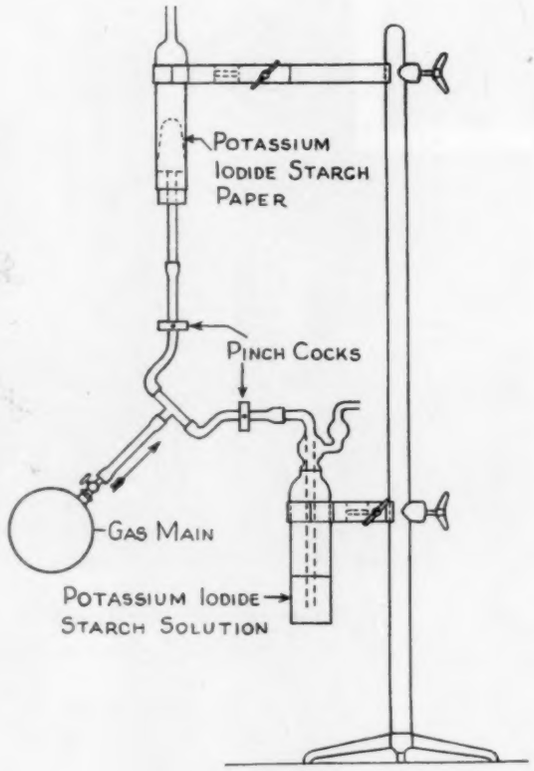


Figure 2

Our advance work had also shown that the injected volume of chlorine was sufficiently large and remained so concentrated in the gas, which was to be measured, that not only purified gas (city gas), but that also foul gases, such as water or producer gas containing H_2S, were not able to destroy the "stopper" or "shot" of chlorine. Even tar fog is not detrimental as the chlorine is immediately evidenced upon its arrival at the testing station.

The procedure for measurement, in the development of which Dr. Matuschka, Engineer Konig and Inspector Ohler have expended a great deal of effort, is as follows: The pipe line, through which the gas is passing and in which the gas velocity is to be determined, contains two opposed holes ½ inch in diameter. (Fig. 1). A

Translated from the original in Zeitschrift Österreiche Gas und Wasserfachmännern 70/9-1930, p. 140-142, by John H. Wolfe, Supt., Consolidated Gas Electric Light and Power Company of Baltimore

tank of liquid chlorine (content of one tank two kilograms), with the valve closed, is connected to each hole. Another ½ inch hole is tapped in the pipe at a distance which is predetermined in accordance with the local conditions and based on estimated gas velocities, so that one might expect the appearance of the injected chlorine at this point in approximately 50, 100 or 200 seconds. A Tee is placed in the latter hole in such a manner that the gas flowing from the line may be simultaneously forced into a wash bottle containing potassium iodide starch solution and against a potassium iodide starch paper. (Fig. 2). A man (Nos. 1 and 2) is stationed at each tank of chlorine, and a third man (No. 3) who is equipped with a stop watch and signal flag stands near them. A fourth man (No. 4) who is likewise equipped with stop watch and flag stands at the second and distant connection.

No. 3 swings his flag in a circle as a signal and No. 4 replies in like manner and allows the gas to flow through the wash bottle and upon the paper. Nos. 3 and 4 now raise their flags and as soon as No. 3 lowers his flag he calls on Nos. 1 and 2 to "Open," whereupon they immediately open the valves of the chlorine tanks wide. At the same time Nos. 3 and 4 start their stop watches, which have previously been set so as to agree.

Significance of Time Interval

As soon as No. 4 observes the appearance of a blue discoloration he stops his watch and at the same time signals to No. 3 with his flag, who immediately stops his watch. The time interval established by reading the stop watch of No. 4 man is that which the chlorine has used in travelling from the point of injection to the point of detection. The stop watch reading of No. 3 man serves as a check.

Our experiments have shown that, when the chlorine is forcibly and simultaneously "shot" from the opposed sides (each tank delivers about 300 grams of chlorine, both together about 600 grams), (in consequence of the chilling of the Cl as it enters the gas stream the volume is automatically regulated), the cloud of Cl remains intact in the gas and is carried forward by the gas at its inherent vel ocity. Also, the consequent reaction occurs so instantaneously and so forcibly that it must inevitably be based upon a large integral mass or stopper of Cl. As a result, an exact and sure determination of the chlorine additions is established by the gas attack.

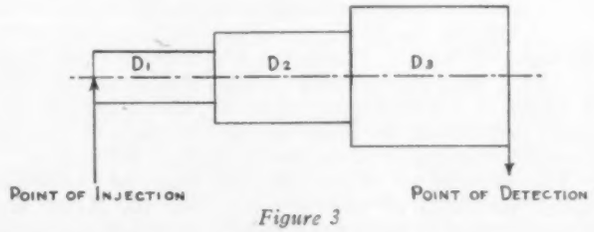


Figure 3

The rate of flow of the impregnated gas per unit of time, which is based on the lapse of time, measured in our case in seconds, is obtained by dividing the volume of the pipe line computed from the diameter (Sections of pipe of different diameters may be added together—Fig. 3), and length measured between the points of injection and detection by the elapsed time. Gas velocity in feet per second equals

$$\frac{V_1 + V_2 + V_3}{t}$$

In order to be certain that the Cl, which had been shot into the pipe completely filled the entire cross section of the pipe at the point of injection, it was necessary to establish whether or not differences existed in the time required for the Cl to arrive at the various points in the cross section. For this purpose we utilized a test length of pipe, which carried completely purified blue water gas previously measured by a station meter. The distance between the point of injection and the point of detection was 535 meters (1755 feet), and the internal diameter of the pipe line was 700 mm (27.6 inches). Three half inch nozzles of 150-300 and 450 mm length (5.9 — 11.8 and 17.7 inches respectively) were inserted in the same plane, at both the point of injection and the point of detection.

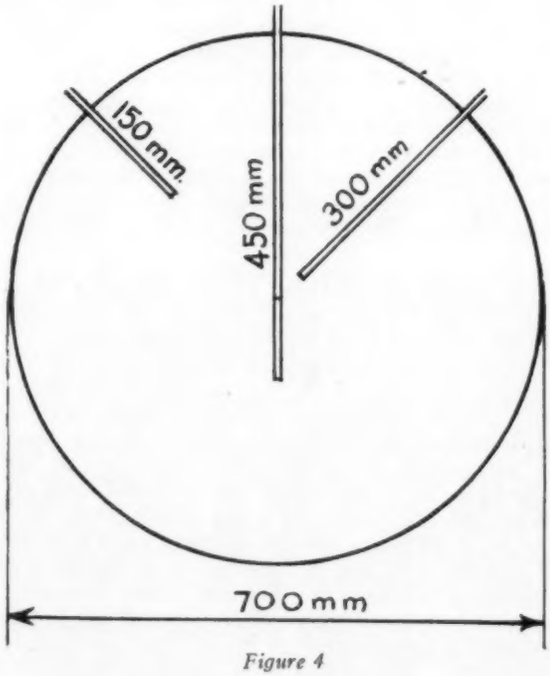


Figure 4

Three consecutive experiments were carried out in such a manner that the Cl was injected at the point of admission, first through the 150 mm nozzle, then through the 300 mm, and finally through the 450 mm nozzle. The three sample pipes at the testing point were utilized simultaneously, and it was established that it was immaterial which nozzle was used in injecting the Cl, since the test (Blue color) for Cl was always simultaneously obtained at the point of determination through all three sample pipes.

In each experiment the index on the station meter was read simultaneously with the injection of the Cl, and again upon its arrival at the point of detection. The results are indicated in the table on page 38.

After it had been established that the length of the injection nozzle was without influence on the time interval, further measurements were made, using the Cl injection method in the majority of which cases the shortest sample pipe was used for withdrawing the gas sample, in other cases, which were in the minority, existing sample pipes which reached to the middle of the pipe, were utilized.

The Cl gas "shot" method was checked twice against other methods of measurement. The first check involved the acceptance test of two steam driven gas turbo blowers of 25,000 cubic meter per hour (882,800 cubic feet per hour) capacity. The gas volume delivered was determined on the one hand by reading the

Test Number	Length of test pipe in feet	Diameter of test pipe in inches	Crosssectional area of pipe in square feet	Volume of test length, cubic feet	Time Interval. Cl injection to detection, seconds	Station Meter passed, Cubic feet	Length of injection nozzle, inches	Gas "Shot" Test: Gas passed cu.ft. per sec.	Gas "Shot" Test: Gas velocity ft. per sec.	Station Meter Test: Gas passed cu.ft. per sec.	Station Meter Test: Gas velocity ft. per sec.	Difference between Gas "shot" and Station Meter Volumes: cu. ft.	Difference between Gas "shot" and Station Meter Volumes: %
								$\frac{7272}{101}$ =	$\frac{1755}{101}$ =	$\frac{6965}{101}$ =	$\frac{6965}{4.14 \times 101}$ =		
1	1755.2	27.6	4.14	7272	101	6965	5.9	72.00	17.38	68.96	16.66	+ 307	+ 4.5
								$\frac{7272}{100}$ =	$\frac{1755}{100}$ =	$\frac{6965}{100}$ =	$\frac{6965}{4.14 \times 100}$ =		
2	1755.2	27.6	4.14	7272	100	6965	11.8	72.72	17.55	69.65	16.82	+ 307	+ 4.5
								$\frac{7272}{97}$ =	$\frac{1755}{97}$ =	$\frac{6745}{97}$ =	$\frac{6745}{4.14 \times 97}$ =		
3	1755.2	27.6	4.14	7272	97	6745	17.7	74.97	18.09	69.54	16.80	+ 527	+ 7.8

station meters and holders, and on the other hand by means of the Cl gas "shot" method. A difference of only 2% resulted from the two determinations.

The second test involved the determination of the gas consumed for underfiring an installation of chamber ovens and an installation of retorts, which both drew their supply of gas for heating from a common installation of central gas producers. The Cl gas "shot" method gave as an average of two determinations (308,-500-305,000 cubic meters), a gas consumption of 306,-500 c.m. in 24 hours for the chamber oven installation and 572,000 c.m. for the retorts, or a combined consumption of 878,500 c.m. The gas volume computed by means of a carbon balance of the central gas producer plant gave a consumption of 901,449 c.m. for both oven installations. The Cl gas "shot" method, therefore, indicated about 2½% less gas.

The preceding examples show that the method outlined is applicable for technical gas measurement, particularly since its use obviates the installation of orifices or nozzles which in many cases are difficult to install. The method finds a counterpart in the so-called salt velocity method of Prof. Allen, which is established in America as one of the most important test procedures for running the acceptance tests on water turbines, and which utilizes a moving cloud or mass of salt produced by means of sudden injection of salt solution, and which is detected electrically (through the determination of the electrical conductivity of the water). This method is described by C. M. Allen and E. A. Taylor ("The Salt Velocity Method of Water Measurement," Transactions of the A. S. M. E. Vol. 14, 1923), and in the "Zeitschrift der Vereines Deutscher Ingenieure," 1930, Vol. 17—"Vergleichs-Wassermessunger am Walchenseerwerk" by Dr.-Ing. O. Kirschner. It should of interest, whenever further opportunity is available, to further check the utility of the gas "shot" method which is here outlined.

Helium For New Giant Airship "Akron"

THE new giant Naval airship, "Akron," depends for the helium used in its navigation on the Government plant near Amarillo, Texas, which was designed and constructed and is operated by the United States Bureau of Mines, Department of Commerce. More than 6,000,000 cubic feet of this rare non-inflammable gas has been shipped from the Amarillo helium plant.

Although the establishment at Amarillo has been in operation only a little more than two years, it has produced more than 22,000,000 cubic feet of helium at an average net cost for that period of $11.47 per thousand cubic feet. An indication of present improved plant performance, brought about through experience in plant operation and improvements in process and equipment constantly introduced is given in production figures for June, 1931, when the net cost of $5.95 per thousand cubic feet was attained.

To mention one other change made possible due to the use of helium, the Akron has a gas-fired cooking range. So far as is known, this is the first time an open flame has been used for cooking on board a dirigible. The location of machine gun nests, airplane hangars, etc., all of which will be found on the Akron, are entirely feasible, due largely to the use of an inert lifting gas.

The Bureau of Mines Helium Plant at Amarillo, which furnishes all of the helium for the Army and Navy, is one of the Government's most self-contained units. When present negotiations are completed the Bureau will own the gas rights in an entire virgin gas structure underlying some 50,000 acres. A Government-owned and operated pipeline conveys gas from this field to the plant, a distance of about 12 miles. The high rock pressure of this structure obviates the necessity of doing any compression on the gas.

Since the gas field is estimated as being good for many years to come, and only about one-half the production plant capacity has yet been needed to meet Government requirements, the Army and Navy are assured of an ample supply of this once rare gas for their lighter-than-air activities.

Forced Warm Air Heating

Mechanics of the Flow and Types of Fans used to distribute the Heated Air

W. E. STARK

Research Engineer, The Bryant Heater & Mfg. Company

HEATING with forced warm air, that is, warm air distributed through systems of ducts to the various heated spaces, is of course, no new thing. Large public buildings, such as schools, department stores and public assembly places, have been so heated for many years. The application of this method of heat distribution to buildings of the residence class is, however, a comparatively modern practice. That forced circulation of heated air has contributed largely to the new dignity that residence warm air heating has been assuming in the last few years, cannot be denied. "Conditioned air," so called (and often miscalled), would not be a possibility for residences were it not for the forced air furnace, or "fan furnace." The heating effects often desired in certain parts of elaborate residences would not be possible without forced distribution of warm air.

Forced warm air heating for residences started in a very humble way. Its beginning was necessarily humble, because not so long ago the furnace was found only in the very modest residence. A furnace heating plant was essentially a cheap heating plant. It was found that a small electric fan, such as an ordinary desk fan, placed in the cold air duct of a furnace heating system, might add sufficient impetus to the flow of air to enable a room, reluctant to heat, to be brought up to its proper temperature. From that modest beginning can be traced the development of the modern forced warm-air heating system for residences.

Flow in a Gravity System

The force producing flow in a gravity warm air heating system is very small. It is due only to the difference between the temperatures, and therefore densities, of the heated air in the pipes and the air at room temperature surrounding the pipes. Assuming a column of heated air at 160 degrees and sixteen feet high (typical second floor condition) surrounded by room air at 70 degrees, in communication with the furnace return inlet, we can find the pressure difference by applying the usual equation for theoretical chimney draft, which is

$$D = 7.64\ H \left\{\frac{1}{T_c} - \frac{1}{T_h}\right\} \qquad (1)$$

where D = Draft (or pressure difference) in inches of water
H = Height of second floor register above base of furnace, in feet
T_h = Absolute temperature in warm air ducts in degrees F.
T_c = Absolute temperature of cold air in degrees F.

In this case:

$$D = 7.64 \times 16\left\{\frac{1}{530} - \frac{1}{620}\right\}$$
$$= 0.0335 \text{ inches of water}$$

Such a small pressure difference as this obligates the designer to the usual gravity furnace practice, large round ducts of minimum length, pronounced pitch of horizontal pipes, central location of furnace in order to keep all ducts of approximately equal length, and omission of air cleaning devices. This small flow-producing force puts the furnace at the mercy of such winds as may at times create a pressure in rooms on the windward side. It limits the warm air heating system to small houses.

Warm air heat has many properties that make it attractive for extensive homes. To take advantage of those properties in the large house, it is necessary to have a greater motive power than gravity can provide. If, at the same time, ducts can be made smaller, more compact, and more circuitous in lay-out, if the furnace can be located to suit the occupant of the home, if air-cleaning devices can be introduced into the system; then the warm-air heating system is endowed with a degree of suitability for large and pretentious homes, which puts it on a basis of equality with radiation heating. Such considerations and inducements have led to the development of the modern forced air heating system.

The modern fan furnace, sometimes called (or miscalled) a "conditioned-air furnace," includes the following essential parts in its construction:

Fan
Heat exchanger
Filters (or other air cleaners)
Humidifying equipment

Whether all of this produces true "conditioned air" depends largely on the manner in which it is controlled. In discussing the various types in which these components of the equipment are found, and the considerations underlying their design and application, the fan will be dealt with first.

Static and Velocity Pressures

Before discussing types of fans, it may be worth while to clarify some of the terms used in fan engineering work, for there is quite a general misunderstanding on the part of many otherwise well grounded engineers as to the true meaning of a number of commonly used terms.

Air pressures are referred to as
Static Pressure
Velocity Pressure
Total Pressure ("impact" or "dynamic")

The static pressure existing in an air duct or in a fan outlet is a measure of potential energy. It is the amount of energy that is available to overcome the frictional or other losses in the duct system,—the energy

available to produce flow. It is, perhaps, more understandable to think of it as the pressure that tends to burst the pipe. It is measured on a gauge, such as a manometer, as the pressure exerted on an orifice that is in a plane parallel to the direction of flow.

Velocity pressure is the pressure that a fluid exerts in a direction parallel to its flow, by virtue of its velocity. Just as a body, projected upward in a vacuum at an initial velocity V would attain a height of $\frac{V^2}{2g}$, so would a column of air projected upward at a velocity V attain a height of $\frac{V^2}{2g}$ (neglecting of course the effect of friction, diffusion, expansion, etc.) The weight of a column of air that would be supported by the impact of a moving stream of air, expressed either in feet of height or in pounds of weight, would be the velocity pressure exerted by that stream of air. In practice, when dealing with air pressures and velocities of the magnitudes usually encountered in forced warm air heating, pressures are expressed in inches of water. Velocity pressure then is expressed as the height of a column of water that would be supported by the impact of a stream of moving air, at *zero static pressure.*

The relation between velocity and velocity pressure is expressed by the equation:

$$V = 1097 \sqrt{\frac{h}{d}} \qquad (2)$$

where V = velocity, in feet per minute
h = velocity pressure, in inches of water
d = density of air being measured, in pounds per cubic foot.

For so called "standard air" as defined by the Code of The National Association of Fan Manufacturers, that is, air at a temperature of 68° F. and a relative humidity of 50%, with a barometric pressure of 29.92 inches, the density is 0.07488 pounds per cubic foot, and the equation becomes

$$V = 4009 \sqrt{h} \qquad (3)$$

Total pressure is the sum of static pressure and velocity pressure, and is the pressure exerted on an orifice that is in a plane perpendicular to the direction of flow.

Interrelation of Static and Velocity Pressures

As static pressure is the pressure available to overcome friction, it is lost through friction and becomes less as the end of the duct is approached. Static pressure is at the maximum value at the entrance to a duct and decreases to zero at the exit, or at the point where the stream of air is discharged into the room being heated. The sum of the total pressure and the friction loss remains a constant. Thus, if the section of a duct is enlarged, with a consequent reduction in velocity and, therefore, in velocity pressure, the loss in velocity pressure is converted into static pressure and the new static pressure is the sum of that in the smaller duct and the change in velocity pressure from the small to the large duct (less the friction loss in the enlargement). Conversely, if the section of a duct is reduced, with a consequent increase in velocity and, therefore, in velocity pressure, the gain in velocity pressure is deducted from the static pressure and the new static pressure is the difference between that in the original duct section and the change in the velocity pressure from the large to the small duct (less the friction loss in the reduction).

The energy contained in a stream of moving air is capable of doing work, and the rate at which it is capable of doing work is its *power.* Since work done at the rate of 33,000 ft. lbs. per minute is one horse power, the horsepower of a stream of moving air, or the *air horse power* is expressed by the equation

$$A\ H\ P = \frac{P \times A \times V}{33000}$$

where P = static pressure exerted by the air stream in lbs. per sq. ft.
A = Area of air stream, in square feet
V = Velocity, in feet per minute.

For "standard air" (previously defined) and for static pressure measurements expressed in inches of water, the equation for air horse power becomes:

$$A\ H\ P = \frac{CFM \times SP}{6356} \qquad (4)$$

where CFM = cubic feet of air per minute
SP = Static pressure in inches of water.

The efficiency of a fan is the ratio between the air horse power as calculated above, and the brake horse power required to drive the fan (excluding bearing friction). This efficiency, being based upon an air horse power that is a function of static pressure, is sometimes referred to as "static efficiency." It represents the ratio of the potential energy contained in the air to the energy required to impart it to the air. In some cases the air horse power used in calculating fan efficiency is based upon the total pressure, in which event the efficiency is referred to as "impact efficiency" or "dynamic efficiency." In comparing fan efficiencies, it is well to know whether static or impact efficiency is being quoted.

Types of Fans

Fans that may be used for forced warm air heating include the following types:

1. Propeller Fans
2. Disc Fans
3. Cased (or centrifugal) Fans
   (a) Forward curved blade
   (b) Backward curved blade
   (c) Radial tip blade

These fans have varying characteristics of performance, which define their fields of usefulness in residence work.

1. The propeller fan is exemplified by some of the ordinary desk fans. The true propeller fan has blades inclined at variable angle to the plane of rotation, the angle increasing from tip to hug. Propeller fans, as actually made, may vary from the true increased-pitch blading, due to the fancy curves and twists put in by the designer in order to secure a definite type of air flow. The section is very much like that of a screw. There is slippage of the air on the blades due to inertia and friction, varying in degree according to the design. Propeller fans, although they have been used to a large degree in domestic furnace work, are specially adapted to installations where it is possible to use them without duct work, such as restaurants, factories, kitchens, etc. They are suitable for use where it is desired to move a large amount of air against a very low resistance. Against resistance, their capacity falls off markedly, making them ill-suited for use in any but the smallest installations, where the ducts are short and liberal in size. Such fans will operate against a pressure if driven at sufficient speed, but their power requirement increases rapidly and the noise is likely to become quite objectionable.

2. *The disc fan* has several flat blades set at a uniform (from tip to hub) angle to the plane of rotation. They are sometimes modified by curving the blades while keeping the angularity constant. Some models have the blades bent sharply at the tip in the direction of air flow, in order to prevent spilling out at the ends.

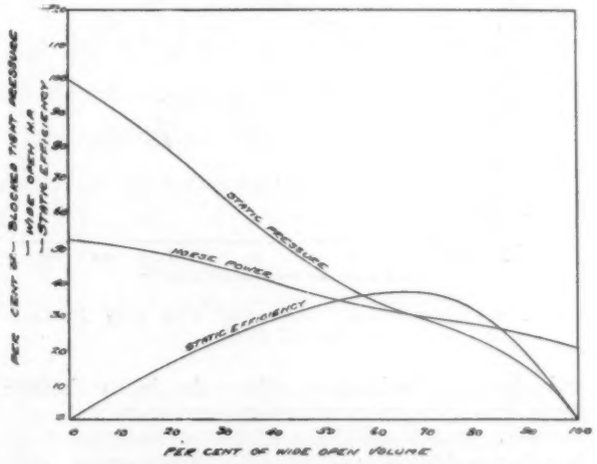

PER CENT OF BLOWED VENT PRESSURE
HORSE POWER
STATIC EFFICIENCY
STATIC PRESSURE
HORSE POWER
STATIC EFFICIENCY
0 10 20 30 40 50 60 70 80 90 100
PER CENT OF WIDE OPEN VOLUME

Fig. 1.—Characteristic Curves of Propellor or Disc Fan

The characteristic curves of disc and propeller fans are practically alike and are as shown in Figure 1. The general flatness of the static pressure curve (as compared with other types of fans) is evidence of the rapid falling off in air handling capacity as the resistance increases. It should be understood that such curves as those represent the performance of a fan at constant speed; the independent variable when the test is conducted being the resistance, and the dependent variables the capacity and power requirement. Notice that the efficiency is not only comparatively low at its maximum value but that it also falls off rapidly with increase in resistance. Such a fan as this, when running at a constant speed, consumes increased power as the resistance increases.

For domestic furnace work, disc and propeller fans are only suitable where the ducts are short and large, with furnaces having a large free area, and where the filter capacity (if any) is so large that the resistance through the filters is small. They are suitable for installations designed according to the rules for gravity flow, rather than for installations designed originally for fan use.

3. *A centrifugal fan* consists of a wheel containing a number of generally shallow blades, extending in planes substantially parallel to the shaft, mounted in a suitable casing. The casing consists of two side sheets, one or both of which may be provided with circular inlets; and an enclosing "scroll" or "round-about," which has the form of an approximate involute of the wheel circle. Air inlets in the wheel correspond approximately to the air inlets in the side sheets. The rotation of the wheel causes a continuous flow of air through the spaces between the blades, in a more or less radial direction from heel to tip of blade. The pressure differential thus set up draws a continuous stream of air in through the inlets to replace that caused to flow out between the blades by centrifugal force. The air discharged by the wheel enters the expanding scroll surrounding the wheel and suffers a reduction in velocity with a corresponding increase in static pressure. The scroll directs the flow of air and also serves to convert velocity pressure into static pressure.

Centrifugal fans are used where it is necessary to handle considerable amounts of air against appreciable resistances, from one-eighth inch of water and over; and when it is desired to handle it economically and noiselessly. In addition to heating and ventilating work, such fans are used for forced and induced draft, tunnel ventilation, drying, dust collecting, and conveying. Practically without exception, domestic warm air furnaces built for fan work are provided with centrifugal fans.

Discussion of Blades

(a) The forward curved blade is most commonly used in ventilating fan wheels. It is capable of moving large quantities of air against moderate resistances at low tip speed, with little noise and with good efficiency. The characteristic curves of such a fan are shown in Figure 2. Notice in comparison with the characteristic curves for the disc fan, that as the static pressure (or duct resistance) rises, the output falls off rather slowly. This means that if errors are made in estimating the resistance, or that if the resistance is variable, the quantity of air handled undergoes little change. It will be seen from the dip in the static pressure curve, that such a fan may be capable of handling three rather widely varying volumes against the same pressure. For this reason, fans with forward curved blades are not good for parallel operation. One of the fans is liable to "hog" all of the load. It will also be seen from the curves, that as the resistance is reduced (at constant speed) the power requirement increases. For this reason, motors to drive such fans must be selected with ample reserve to take care of the contingency of unlooked for reduction in static pressure. The working range is on the right hand side of the peak in the efficiency curve.

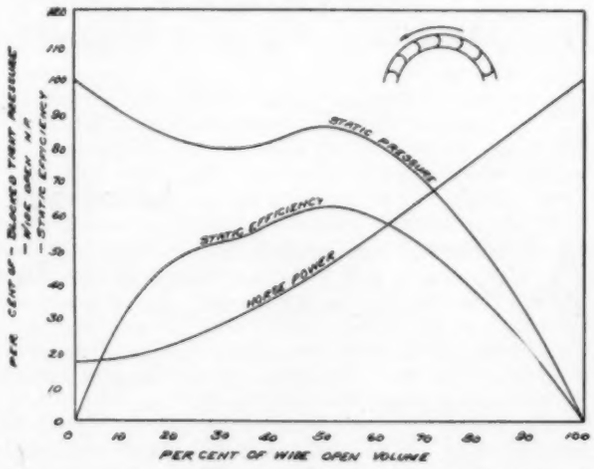

PER CENT OF BLOWED VENT PRESSURE
HORSE POWER
STATIC EFFICIENCY
STATIC PRESSURE
STATIC EFFICIENCY
HORSE POWER
0 10 20 30 40 50 60 70 80 90 100
PER CENT OF WIDE OPEN VOLUME

Fig. 2.—Characteristic Curves of Fan with Forward Curved Blades

(b) The backward curved blade fan has been used very little in warm air furnace work. It is characterized by high speed, steep static pressure curve, and *descending* horse power curve. (See Figure 3). The tip speed for such a fan is approximately 250 per cent of that of a forward curved blade fan doing the same work, and it is also considerably more bulky and expensive. On account of the high speed it is suitable for direct connection to motors. The steep static pressure curve gives it constant air handling capacity under changing pressure conditions. The absence of dips in the pressure curve renders the fan capable of parallel operation. The horse power characteristic is insurance

against overloading of the motors. These fans are highly efficient. They find their chief use in stoker work, for which they are unexcelled. Their high cost militates against their use in furnace work.

(c) The fan with radial tip blades is suitable for furnace work. Its efficiency is good, its static pressure curve is relatively steep, and its horse power curve rises less rapidly than that of a forward curved blade fan. It is capable of parallel operation. Its characteristic curves are shown in Figure 4.

From this discussion of the characteristics of the various commercial types of fans, it will be seen that there are several items that are to be considered in choosing the proper type of fan for a given duty. The propeller or disc fan is, of course, the cheapest. However, it is incapable of operating against pressure, unless run at such high speed that it becomes noisy. It can be used only for free discharge or where the duct resistance is quite low. Increases in resistance reduce its capacity sharply. In the multibladed fans, we find that the forward curved blade fan operates at lowest speed, is least bulky, but is also least efficient, and will not operate successfully in parallel. The fans with radial tip blades or with backward curved blades are most efficient, but are increasingly bulky and costly. They are capable of parallel operation. When all these considerations are carefully weighed, we find that for fan furnace work, the fan with forward curved blades has the greatest all round economy. First cost is less, on account of the small power consumption efficiency is of little moment, and in furnace work fans are rarely called upon to operate in parallel or under conditions where the resistances will differ in the slightest.

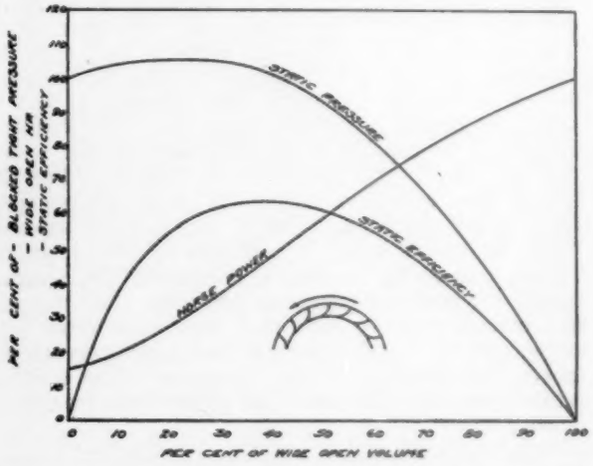


Fig. 3.—Characteristic Curves of Fan with Radial Tip Blades

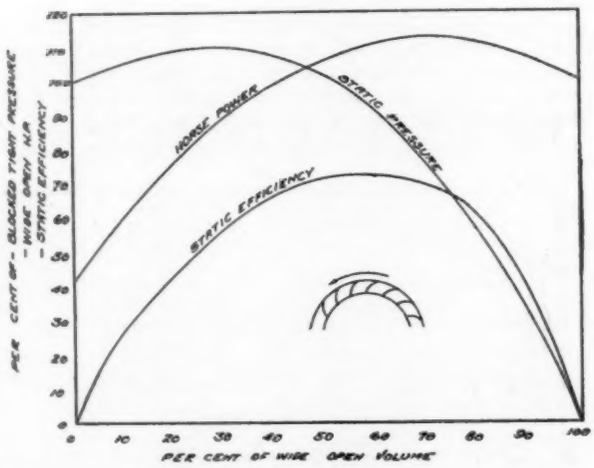


Fig. 4.—Characteristic Curves of Fan with Backward Curved Blades

Automatic Butane Plant

AN automatic butane plant is now supplying gas to Canajoharie and Palatine Bridge in New York State. The distribution system and mixing plant were recently completed for New York Power and Light Corporation, a unit of the Niagara Hudson System, and there are more than 300 customers receiving gas service in the two villages.

The mixing plant is located in a building 30 feet square. The building, of brick construction is in two sections—one containing the vaporizers, mixers and compressors and the other, the heating equipment and electrical apparatus. The plant was erected by the New York Power and Light construction department.

Some difficulty was encountered in laying mains and service pipes in the West Hill section because of the rock which appeared about a foot below the surface soil. Since the pipes are laid about two feet underground, about a foot of rock excavation throughout the area was necessary.

This butane gas plant is the first to be installed on the Niagara Hudson System.

The butane in liquid form is brought in railroad tank cars, which enter the yard over a new 500-foot siding. Here the liquid is stored in a tank, 40 feet long and 8 feet in diameter, having a capacity of 15,000 gallons. From this tank the liquid flows into the building under pressure, where it is vaporized through the application of hot water heat. The gas is mixed with air in proper proportion to produce the required heat units and is then pumped by a compressor into a storage tank, 70 feet long and 8 feet in diameter, under a pressure of 75 pounds. From here it enters the distribution main, passing through an automatic governor which reduces the pressure for distribution throughout the village.

The plant has a capacity of 9000 cubic feet per hour. Duplicate equipment in vaporizers, mixers and compressors is provided, so as to meet emergency conditions in case of failure of the equipment. The plant is so constructed that in case of failure of either machine, the other automatically comes into play.

From the plant, a six-inch pipe line has been run through the village business section and north to Palatine Bridge, crossing the Mohawk River. Two-inch mains have been extended throughout the remainder of the villages to supply the customers. Automatic regulators have been installed on each lateral to further reduce the pressure to the correct point for the best and most economical operation of gas appliances.

Research in A New Method of Househeating

The use of gas-vapor mixtures in the gas fired househeating furnace promises high efficiency and simplicity of operation

C. A. DUNHAM

President, C. A. Dunham Co. Chicago

The major portion of this article which is an abstract of an article, "Using Gas-Vapor Mixtures for Heating Purposes," by Mr. Dunham, appearing in August issue of the Journal of the American Society of Heating and Ventilating Engineers, has been considerably added to by the author. Its careful reading and study are recommended to all gas men interested in the development of this phase of utilization. —Editor.

TO the engineer is committed the important task of correlating available manufactured heating appliances with the best approved practice in engineering. The large installation calls for professional skill in calculating the heat losses under given conditions and for selecting the equipment to deliver the heat.

The size, height and costs of buildings appear to be steadily increasing year by year. This fact makes the engineer's responsibility to the building industry correspondingly greater. To him there has come a definite call for the guiding of building construction and equipment into channels where early obsolescence shall not overtake it.

Mechanical means for proportioning just the right heat supply to balance the heat loss of a building has been developed and made available for general use during the past five years. Its practical solution has uncovered some very definite advantages not inherited from the accepted methods of the past.

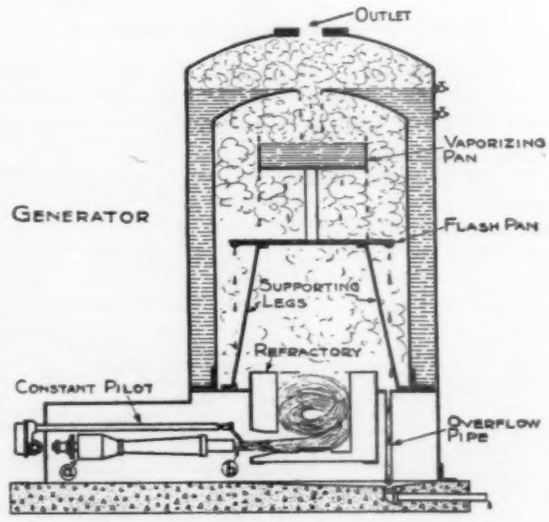


Fig. 1.—Section Through Generator

However, all the interesting problems are not confined to the large heating installations. There is an existing field of major proportions which has intrigued experimentation and research and which may properly command the attention and interest of men foremost in the profession and in industry.

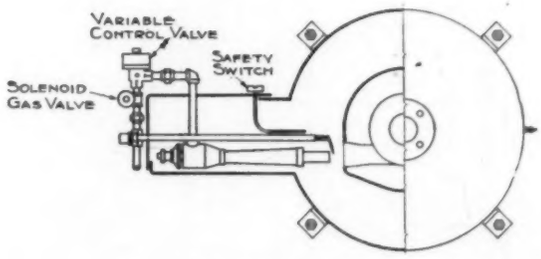


Fig. 2.—Top View of Generator

We have in mind units for conveying heat comfort to the modest home which, under the modern trend, demands past luxuries as present day conveniences.

For several years, considerable study has been given to a method hereinafter detailed which now appears to have economical advantages for relating the use of gas heating to even smaller installations than have been deemed practical heretofore. An investigation of earlier efforts in mixed gases indicates that these have been quite limited and clearly void of means for making any such methods practical for heating purposes.

This new principle involves the burning of gas in the presence of water and at pressures slightly below atmospheric with a flow of the mixture of combustion products and steam through radiators, for the purpose of imparting heat to spaces remote from the location of the mixed fluid generator.

Description of Furnace

An especially designed generator with suitable gas controls was employed (see Figs. 1 and 2). The refractory with circular interior receives the gas flow introduced on one side near the bottom. The flame travel within this bowl is increased by means of the whirling action imparted by the rapid expansion of the burning gases injected into the refractory. The primary air is drawn into the burner at (a) and the secondary air is drawn in between the end of the burner and the refractory opening at (b). The flame passes through the hole into the refractory which soon becomes heated, and perfect combustion takes place before the flame reaches any cooler surfaces.

It will be observed in Fig. 1 that the generator has a double wall and that the dome of the inner wall is open at a point directly below the supply outlet of the generator. When the water level between the walls rises to an overflowing point (due to the expansion by heat) the water drips into a pan located directly below the opening as indicated. This pan in turn overflows on to the flash plate which is slightly cupped to hold a shal-

low supply of water. Any surplus water passes to waste by dripping off the edge and down into the drain through the overflow pipe.

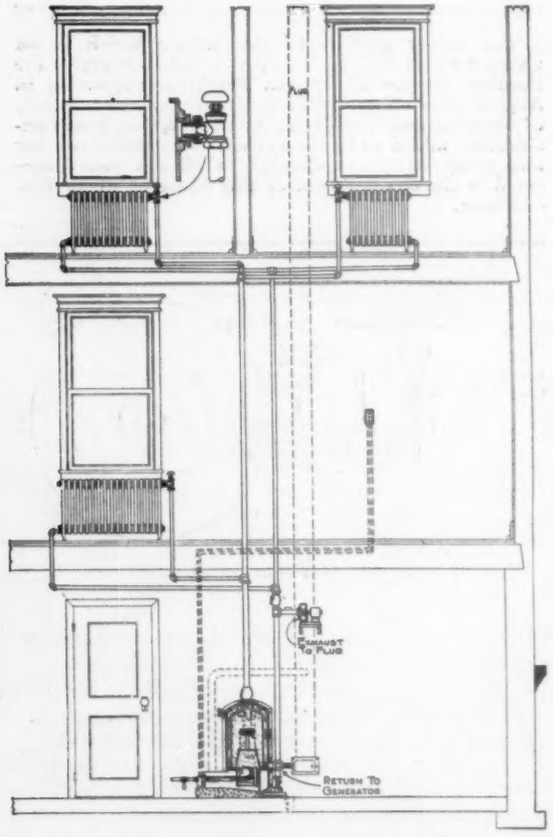


Fig. 3.—Complete System Applied to a House

A complete system as it was applied to a house is shown diagrammatically in Fig. 3. A small fractional horse power electric motor operates an exhauster which in turn exerts a suction through the radiators and generator. It starts operating when the room push button is pressed and simultaneously brings on the gas for ignition by the constant burning pilot. This push button may be further supplemented to operate under the control of a room thermostat.

After the gas is ignited, the sheet of water reaches the flash pan and is giving off vapor with no appreciable lapse of time. The products of combustion after mixing with the vapor, are drawn immediately into the radiators where the vapor is condensed, the gases cooled, and the heat thus passed to the room being heated. The condenser vapor is returned to the water space between the walls of the generator.

The body of water which lies back of the inner wall of the generator and in direct contact with it, responds to the initial heat input by expanding, thus causing a trickling or overflowing into the vaporizing pan and then dripping to the flash pan below. This flow is made continuous by the constant return of the condensed vapor. These heating surfaces coupled with the surface area of the drops of water, present a large heating area and cause surprising results in vaporizing possibilities.

Why Water Is Used

The question might arise as to why water is used instead of the gases to carry heat. The primary reason is that gas is not an economical heat vehicle. Without the water content a very high temperature would be created within the generator. The gases which are carried to the heat dissipating medium then bear no established relation in temperature to those in the generator, and the distance of the travel of gases at given temperatures through the piping is very short.

A test without any surplus water content showed a temperature of 600° F. at the outlet of the generator. At the entrance to the first radiator 20 ft. from the generator, the temperature was only 90° F., and the radiator would not heat completely without undue forcing.

By adding water, the conducting capacity of the pipes was materially increased and the temperature of the generator decreased to a level corresponding more closely to the heat input to the farthest radiator. In other words, an appreciable portion of the sensible heat in the gases was absorbed as latent heat and conveyed to the most distant points by the better heat carrying medium created by the additional water content.

In operation, practically all vapor returns to the generator after having given up its heat by condensing. The hydrogen content of the gas by combination with oxygen through combustion processes provides a surplus of water beyond that required by the generator to form the heating medium and above the slight losses through the exhausted gases; this surplus water passes away through the drain. All non condensable gases when cooled are drawn from the return pipe and discharged to the flue by the exhauster.

A recent test was made to obtain the efficiency of the generator and also a heat balance to account for all the heat losses of such a type of heating system.

Fig. 4 is a diagram of the complete test set-up. A unit heater was installed in the regular floor stand with the outlet connected to a duct approximately one foot square. As shown in these figures the generator, unit heater and a portion of the duct were insulated.

Method of Performing Investigation

In order to obtain a test wherein it would be possible to know that the set-up had reached uniform operating temperatures, the apparatus was operated continuously

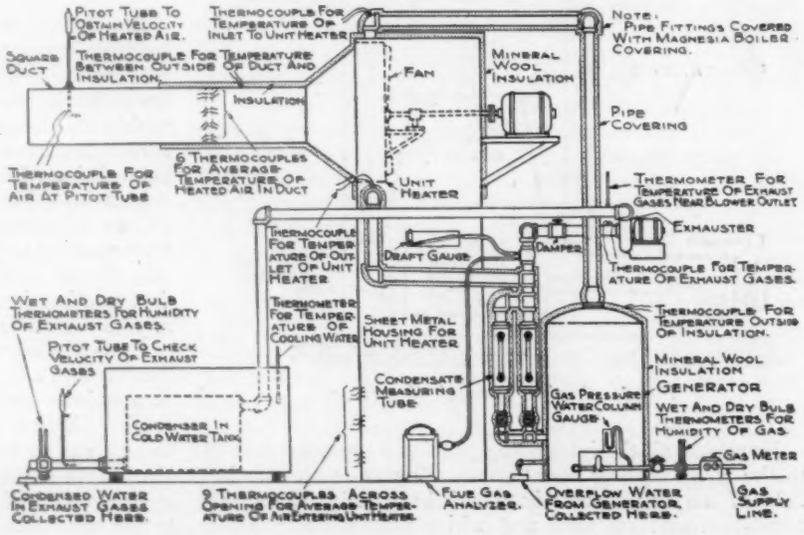

Pitot Tube To Obtain Velocity Of Heated Air.
Thermocouple For Temperature Of Inlet To Unit Heater
Note: Pipe Fittings Covered With Magnesia Boiler Covering.
Square Duct
Thermocouple For Temperature Between Outside Of Duct And Insulation.
Insulation
Fan
Mineral Wool Insulation
Pipe Covering
Thermocouple For Temperature Of Air At Pitot Tube
6 Thermocouples For Average Temperature Of Heated Air In Duct
Unit Heater
Thermometer For Temperature Of Exhaust Gases Near Blower Outlet
Exhauster
Thermocouple For Temperature Of Outlet Of Unit Heater
Draft Gauge
Damper
Thermocouple For Temperature Of Exhaust Gases.
Wet And Dry Bulb Thermometers For Humidity Of Exhaust Gases.
Thermometer For Temperatures Of Cooling Water
Sheet Metal Housing For Unit Heater
Thermocouple For Temperature Outside Of Insulation.
Pitot Tube To Check Velocity Of Exhaust Gases
Mineral Wool Insulation
Condensate Measuring Tube
Generator
Gas Pressure Water Column Gauge
Wet And Dry Bulb Thermometers For Humidity Of Gas.
Condenser In Cold Water Tank
Gas Meter
Condensed Water In Exhaust Gases Collected Here.
9 Thermocouples Across Opening For Average Temperature Of Air Entering Unit Heater.
Flue Gas Analyzer.
Overflow Water From Generator Collected Here.
Gas Supply Line.

Fig. 4.—Arrangement of Apparatus for Test

for a period of several hours to assure constant conditions and until similar readings were obtained. The readings were recorded and for two more hours, when an average of five readings, one each half hour, was taken and used as the basis for the calculation of the results of this report.

Heat values of the gas were obtained from an analysis made by the Northern Indiana Public Service Co., the net heat content averaging 577 B.t.u. per cubic foot. (*See calculation No. 1)

Correction of gas at meter to standard conditions 0.963. (*2)

Water vapor supplied to the system during the test equalled .437 lb. per hour through moisture content in the air and by the gas supply. (*3)

The water produced by combustion equalled 6.76 lb. per hour. (*4)

Percent of excess air used during period of test 19.6%. (*5)

769.5 cu. ft. of non-condensable flue gases was the rate per hour. (*6)

The gross B.t.u. value of the fuel gas burned per hour is 76,841.6.

The water vapor loss from exhaust gases was practically one half pound per hour. (*7)

Water carried to atmosphere by the flue gases 2.09 lb. per hour. (*8)

Heat loss of system through liquid and vapor loss 5976 B.t.u. per hr. (*9)

The heat of vapor loss from vapors supplied by air and gas 11.4 B.t.u. per hour. (*9)

Heat lost from system as sensible heat of dry gases based on flue gas analysis = 839.7 B.t.u. per hr. (*10)

Heat lost through flue = 7014 B.t.u. per hr. (*18)

Heat lost in overflow from generator = 36 B.t.u. per hr. (*18)

Heat produced by combustion of flue gas = 76,842 B.t.u. per hr.

Detailed Calculations

(1) Heat Value of Gas. The heat value of the gas was obtained from an analysis made by the Northern Indiana Public Service Company, the net heat content averaging 577 Btu. per cubic foot. The composition of the gas was as follows:

CO_2	=	1.8 per cent
O_2	=	2.8
N_2	=	16.0
CO	=	6.0
H_2	=	33.2
CH_4	=	35.1
C_2H_6	=	1.5
Illuminants	=	3.6
Total	=	100.0 per cent

The gross heat value on this basis was 641 Btu. per cubic foot.

(2) Correction of gas as metered to standard conditions of 60 F. 30 in. mercury and 0 per cent humidity.

Conditions of gas at meter during the test:

Average wet-bulb temperature.....	55.1 F.
Average dry bulb temperature.....	71.6 F.
Pressure above atmosphere.....	4¾″ in. water
Atmospheric pressure	29.50 in. mercury
Absolute pressure of the gas.....	29.85 in. mercury

Consider vapor pressure in the gas equal to vapor pressure in air having the same wet-bulb and dry-bulb temperatures = 0.3 in. mercury. Absolute pressure of dry gas as metered = 29.85 — 0.3 = 29.55 in. mercury. Correction factor for converting cubic feet of gas as metered to dry gas at 60 F. and 30 in. mercury $= \frac{460+60}{460+71.6} \times \frac{29.55}{30} = 0.963$ *Average gas consumption as metered during test—124.4 cu. ft. per hour.* Dry gas at standard conditions = 124.4 × 0.963 = 119.9 cu. ft. per hour.

(3) Water vapor supplied to the system during the test.

(a) By gas supply.

Condition of gas entering burner: Wet-bulb temperature 55.1 F.; dry-bulb temperature, 71.6 F.

Consider water content of gas equal to that of air at same wet- and dry-bulb temperatures = 0.0004 lb. per cubic foot of gas as metered. Weight of water in gas supply = 124.4 × 0.0004 = 0.050 lb. per hour.

(b) By air supply.

Conditions of air used during test: 71.2 F.; 29.50 in. mercury; 38 per cent relative humidity.

Saturated vapor pressure at 71.2 F. = 0.7695 in. mercury. Density saturated vapor pressure at 71.2 F. = 0.001201. Vapor pressure in air as used = 0.38 × 0.7695 = 0.292. Pressure of dry air = 29.50 — 0.29 = 29.21.

Volume of dry air at 60 F. and 30 in. mercury used per hour = 808.2 cu. ft. (see item (5)). Volume of air as used $= \frac{460+71.2}{460+60} \times \frac{30}{29.21} \times 808.2 = 847.9$ cu. ft. per hour.

Moisture content of air as used = 0.38 × 0.001201 = 0.0004564 lb. per cubic foot. Weight of water in air supply = 847.9 × 0.0004564 = 0.387 lb. water per hr.

Total water vapor supplied to system from moisture content in the air and by the gas supply = 0.0500 + 0.387 = 0.437 lb. per hour.

(4) Water produced by combustion. A vacuum of one inch of water existed at the top of the generator connection. The combustion of one cubic foot of dry gas at 60 F. and 30 in. mercury produces 1.185 cu. ft. of water at the same conditions. The theoretical volume if water vapor were a perfect gas at standard conditions = 1.185 × 119.9 = 142.1 cu. ft. of H_2O produced per hour. Weight of water produced by combustion = 142.1 × 0.04758 = 6.76 lb. per hour.

(5) Per cent excess air.

Average analysis of flue gas:

CO_2	=	8.7 per cent
O_2	=	3.7
CO	=	0
N_2	=	87.6
Total	=	100.0 per cent

Excess O_2 per cubic foot of flue gas = 0.037 cu. ft. Necessary O_2 per cubic foot of flue gas = 0.226 — 0.037 = 0.189 cu. ft.

Per cent excess O_2 and air $= \frac{0.037}{0.189} = 19.6$ per cent. Air required for combustion of one cubic foot of gas plus excess air = 5.633 × 1.196 = 6.741 cu. ft. Dry air supplied = 6.741 × 119.9 = 808.2 cu. ft. per hour at standard conditions.

(6) Non-condensable flue gases per hour. Total volume of non-condensable flue gases per cubic foot of dry gas burned in test equals volume of gases produced by combustion plus excess air = 5.308 + 5.633 × 0.196 = 6.418 cu. ft. Non-condensable flue gases per hour = 6.418 × 119.9 = 769.5 cu. ft.

(7) Water vapor which would have escaped per hour during test if gas had burned at an efficiency of 100 per cent. If gas were burned in air at an efficiency of 100 per cent under standard conditions, perfect combustion would be obtained without excess air, and the product of combustion would be cooled to 60 F. at 30 in. mercury pressure. In other words, the gross heat value of the gas would be obtained. The volume of non-condensable flue gases per cubic foot of dry gas burned at 100 per cent efficiency = 5.308 cu. ft. (Gas volume at standard condition.) Gases remain saturated at 60 F. Saturated vapor pressure at 60 F. = 0.5214 in. mercury. Pressure of dry gases = 30.0 — 0.52 = 29.48 in. mercury. Volume of saturated gases $= \frac{30}{29.48} \times 5.308 = 5.402$ cu. ft. Density of saturated vapor at 60 F. = 0.000829 lb. per cubic foot. Water vapor escaping per cubic foot of gas burned = 5.402 × 0.000829 = 0.004479 lb. Water vapor which would have escaped during test if gas had burned at an efficiency of 100 per cent = 119.9 × 0.004479 = 0.54 per hour.

(8) Water carried to atmosphere by flue gases. Non-condensable flue gases per hour at standard conditions (from item (6)) = 769.5 cu. ft. Gases enter the atmosphere saturated at 93.6 F. Atmospheric pressure = 29.50 in. Saturated vapor pressure at 93.6 F. = 1.589 in. Pressure of dry gases = 29.50 — 1.59 = 27.91 in. mercury. Volume of gases entering atmosphere $= \frac{460+93.6}{460+60} \times \frac{30}{27.91} \times 769.5 = 880.6$ cu. ft. per hour. Vapor content = 0.002375 lb. per cubic foot. Water vapor carried to atmosphere = 880.6 × 0.002375 = 2.09 lb. per hour.

(9) Heat loss of system through liquid and vapor loss. This is equal to the water whose heat of liquid above 72 F. (room temperature) and heat of vaporization is lost.

Water collected at condenser outlet plus water escaping to gas minus water vapor which would have escaped through flue to atmosphere minus water vapor supplied to system by air and if gas had burned at 100 per cent efficiency = 4.40 + 2.09 — 0.05 — 0.387 — 0.54 = 5.51 lb. per hour. The temperature of the combustion products entering the flue was 130° F. Total heat of vaporization lost = 5.51 × 1,020 = 5,620 Btu. per hour. Heat of liquid lost = 5.51 × (130 — 72) = 320 Btu. per hour. Heat of liquid of overflow from generator is lost = 0.47 (150 — 72) = 36 Btu. per hour. Total heat lost as heat of vaporization and heat of liquid = 5,620 + 320 + 36 = 5,976 Btu. per hour.

(10) Heat lost from system as sensible heat of dry gases.

Heat lost from system as sensible heat of dry gases based on flue gas analysis = 880.6 × 0.06850 × 0.24 × (130 — 72) = 839.7 Btu. per hour.

(11) Total accountable heat loss

Latent heat	= 5,620 Btu. per hour	(Item (9))
Heat of liquid.....	= 320 Btu. per hour	(Item (9))
Sensible heat of gases...	= 840 Btu. per hour	(Item (10))
Heat loss through flue..	= 6,780 Btu. per hour	
Total accountable heat loss	= 6,780 + 36 Btu. at overflow (Item (9)) = 6.816 Btu. per hour.	

(12) Heat produced by combustion of fuel gas. Gross heat value of fuel gas burned per hour = 119.9 × 641.1 = 76,841.6 Btu. (See items 1 and 2.)

(13) Velocity of flue gas and vapor through 2 in. pipe discharge to atmosphere.

Condition of gases at point velocity head was measured: saturated at t = 93.6 F. and b = 29.50 in.

$V = k\sqrt{h}$

$$k = 952.8 \times \sqrt{\frac{460 + 93.6}{29.50}} = 4{,}125.6$$

Average $\sqrt{h} = 0.212$ (h measured at center of pipe)

Correction for $\sqrt{h}$ taken as 0.933

$$\text{Correction for density} = \sqrt{\frac{0.07068}{0.07088}} = \sqrt{0.9972} = 0.9986$$

$V = 4{,}125.6 \times 0.175 \times 0.933 \times 0.9986 = 676.5$ ft. per minute.

(14) Rate of flue gas discharge to atmosphere = Q = A × V. A = 0.0233 sq. ft. (for 2-in. pipe). V = 676.5 ft. per minute (from item (13)). Q = 0.0233 × 676.5 = 15.76 cu. ft. per min. or 945.6 cu. ft. per hr.

(15) Density of flue gases. Density of dry flue gases at 93.6 F. and 29.50 in equals 1.0244 × 0.07068 = 0.07240 lb. per cu. ft. Pressure of saturated vapor at 93.6 F. = 1.589 in. of mercury. Density of saturated vapor at 93.6 F. = 0.002375 lb. per cu. ft. Pressures of dry gases in mixture = 29.50 — 1.59 = 27.91 in. mercury. Density of dry gases at 93.6 F. and 27.91 in. mercury $= \frac{27.91}{29.50} \times 0.07240 = 0.06850$ lb. per cu. ft. Weight of one cu. ft. of the gas vapor mixture = 0.06850 + 0.00238 = 0.07088 lb.

(16) Water carried to atmosphere by flue gases. Gases and vapor discharged at 93.6 F. and 29.50 in. mercury = 945.6 cu. ft. per hour. The water vapor per cu. ft. of mixture = 0.002375 (item 15). Water carried to atmosphere by flue gases = 945.6 × 0.002375 = 2.25 lb. per hr.

(17) Total heat of vaporization lost. By procedure similar to that given in (item 9), the total heat of vaporization lost = 5,783 Btu. per hour, and the heat of liquid = 329 Btu. per hour lost in the flue gases.

(18) Heat lost at sensible heat of non-condensable flue gases = 945.6 × 0.06850 × 0.24 × (130 — 72) = 901.7 Btu. per hr.

(19) Heat loss through flue and from overflow.

Latent heat	= 5,783	Btu. per hr.
Heat of liquid	= 329	
Sensible heat of gases..	= 902	
Total loss through flue	= 7,014	Btu. per hr.
Loss from overflow...	= 36	
Flue and overflow losses	= 7,050	Btu. per hr.

(20) Velocity of air in discharge duce = V = k $\sqrt{h}$. For dry air $k = 952.8 \sqrt{\frac{460 + t}{b}}$

Condition of air in duct during test at point velocity head was measured: Average t = 97.6 F.; b = 29.50 in.; relative humidity = 12½ per cent; $k = 952.8 \sqrt{\frac{460 + 97.6}{29.5}} = 4134.6$.

Average $\sqrt{h} = 0.648$ (h taken at center of duct). Correction factor for $\sqrt{h} = 0.933$. Density of dry air at 97.6 F. and 29.50 in. mercury = 0.070186 lb. per cu. ft. Density of air at 12½ per cent relative humidity, 97.6 F., and 29.50 in. mercury = 0.069986 lb. per cu. ft.

$$\text{Correction factor for humidity of test air} = \sqrt{\frac{0.070186}{0.069986}} =$$

1.0014. V = 4,134.6 × 0.648 × 0.933 × 1.001 = 2,502.0 ft. per minute.

(21) Rate of air flow through discharge duct = Q = A × V. A (of duct) = 0.989 sq. ft. V (from item 20) = 2,502.0 ft. per min. Q = .0989 × 2,502 = 2,474.4 cu. ft. per minute, or 148,464 cu. ft. per hr. Density of air under test conditions (12 per cent relative humidity, 97.6 F., 29.5 in. mercury) = 0.069986 lb. per cu. ft. W = 148,464 × 0.069986 = 10,390 lb. per hr.

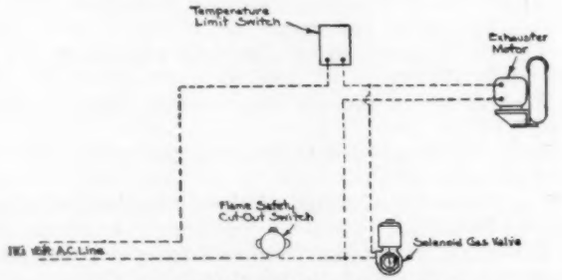


Fig. 5.—Standard Wiring of Generator

(22) Heat delivered by radiator equals pounds of air per hour times average specific heat times temperature rise in degrees F. Average specific heat of test air = 0.243. The average temperature of air in the discharge duct was 101.1 degrees. By test it was found that the air was heated 1.5 deg. by the action of the fan. Thus the actual rise of temperature due to generator = 101.1 — (72.7 + 1.5) = 26.9 deg. Heat delivered by radiator = 10,390 × 0.2430 × 26.9 = 67,920 Btu. per hour.

(23) Heat balance.

Heat delivered by radiator.....		67,920 Btu. per hr.
Lost through the flue		
(a) by flue gas analysis.....6,780		
(b) by Pitot tube measurements 7,014		
Average		6,897
Lost in overflow		36
Unmeasured losses, including heat loss through insulation		1,989
Total heat output of unit.....		76,842 Btu. per hr.
Total heat input to unit.....		76,842 Btu. per hr.

(24) Calculation of total heat loss through flue if flue gases had been cooled to 97 F. at the exhauster. Non-condensable flue gases per hour (volume at standard conditions) = 769.5 cu. ft. (item 6). Pressure of gases at inlet to exhauster = 3.5 in., water below atmosphere or 29.50 — 0.26 = 29.24 in. mercury, absolute. Saturated vapor pressure at 97 F. = 1.763 in. mercury. Pressure of non-condensable gases = 29.24 — 1.76 = 27.48 in. mercury. Volume of saturated gases entering exhauster $= \frac{460 + 97}{460 + 60} \times \frac{30}{27.48} \times 769.5 = 899.8$ cu. ft. per hour. Density of saturated vapor at 97 F. = 0.002621 lb. per cubic ft. Water vapor entering flue = 899.8 × 0.002621 = 2.36 lb. per hour.

Water vapor whose heat of vaporization and heat of liquid to 72 F. is lost = total vapor entering exhauster minus water vapor supplied to system by air and gas minus water vapor which would have escaped if gas had been burned at 100 per cent efficiency = 2.36 — 0.05 — 0.387 — 0.54 = 1.38 lb. per hour. Total heat lost as heat of vaporization; 1.38 × 1038.2 = 1432.7 Btu. per hour. Heat lost as heat of liquid = 1.38 (97 — 72) = 34.5 Btu. per hour. Heat lost as sensible heat of non-condensable gases = 880.6 × 0.06850 × 0.24 × (97—72) = 361.8 Btu. per hour. Total heat lost through flue = 1432.7 + 34.5 + 361.8 = 1829 Btu. per hour. Heat loss in overflow from generator = 36 Btu. per hour (item 8). Total heat loss through flue if gases had been cooled to 97 F. at the exhauster = 1865 Btu. per hour.

Results

With an exhaust temperature of 130 F. at exhauster outlet the efficiency of the system =

$\frac{\text{heat supplied} - \text{heat lost}}{\text{heat supplied}} = \frac{76{,}842 - 6{,}816}{76{,}842} = 91.1$ per cent based on flue gas analysis.

For checking purposes, the efficiency of the system based on Pitot tube readings and calculations is next determined as follows: $\frac{76{,}842 - 7{,}050}{76{,}842} = 90.8$ per cent. (See items 13 to 19 inclusive.)

The efficiency of system based on duct method is next found from items (20), (21), (22) and (23). By the duct method the total heat accounted for leaving the system = 70,435 + 7,025 + 36 = 77,496 Btu. per hour. Efficiency of system = $\frac{\text{heat delivered by radiator}}{\text{heat supplied to system}} = \frac{67{,}920}{76{,}842} = 88.4$ per cent.

Based on outlet temperature of 97 F. at the exhauster, which temperature was attained on actual installations, the efficiency of system based on flue-gas-analysis method (see item 24) indicates a possible efficiency of 97.6 per cent.

Durability

Past experience with the use of products of combustion associated with water vapors very probably causes one to ask the question, "what about corrosion?" Observations extending over a period of two years would indicate that where the fuel is natural gas, coal or coke oven gas burned under the conditions of this test, the rate of penetration indicates a long life which is comparable to other types of heating systems. Examination of a generator interior, after almost a year of use with Chicago artificial gas, shows a degree of corrosion that is surprisingly small and entirely negligible.

Summary and Conclusions

This paper is based on tests made on a specially constructed generator in which gas is burned in the presence of water, thus forming a gas-vapor mixture for heating radiators. The most important considerations may be summed up briefly as follows:

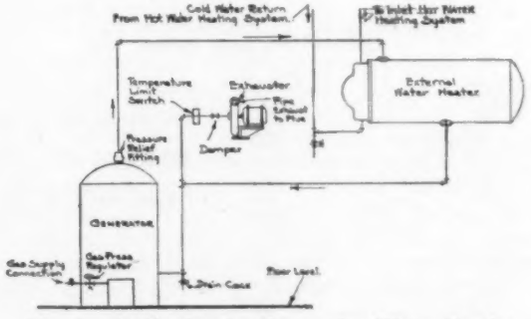


Fig. 6.—Application for Conversion Water Heating

(1) The elimination of loss in heat transfer through metals at point of heat generation.
(2) The reduction in loss of heat from flue gases.
(3) Absorption of sensible heat in the gas by conversion to latent heat in vapor which in turn makes it possible to convey heat in long distances without appreciable loss in sensible temperature.
(4) Reduced temperatures and pressures of gas-vapor, thereby minimizing corrosion as indicated by definite tests showing the rate of penetration per year to be within limits which admit of practical use.
(5) Simplicity. An overall efficiency for gas fuel in the 90 per cent range.

While the Generator described in the foregoing was designed primarily for direct application to the heating of radiators (either direct or concealed) its application to heating hot water for conversion purposes, is tentatively shown in line drawing cut No. 6 as indicated. It may be readily tied in with an intermediary heater thus displacing the usual heating boiler or it may be valved in on a "change over" to serve heat by means of gas during the mild weather, while the coal burning boiler left undisturbed on the installation may be used alone (or for supplementing the Generator) during the extreme cold weather when it is desirable to even the gas load.

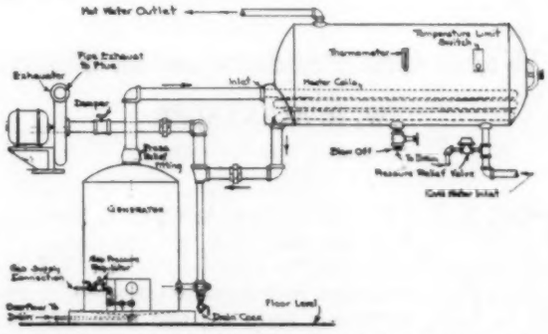


Fig. 7.—Heating Hot Water for Domestic Use

This method of heating may likewise be used for heating hot water for domestic use either summer or winter (see cut No. 7). The mild temperature of the gas vapor mixtures, insures economies against over heating and the dangers arising from scalding temperature approaching steam.

It is not the desire to convey the impression that all angles of this method of heating have been investigated. That is conceded as too large an undertaking to complete in two years' time. The first investigations were centered on results where it was apparent that additional time was required to prove the causes.

Incandescent Lamps as Gas Analysers

A SIMPLE, portable, electric apparatus has been devised for the quantitative indication of the composition of gases, when the qualitive composition is known. Two electric light bulbs, opened at the end to admit gases, are utilized to measure the relative heat conductivities of an unknown, and a known gas. Calibration curves showing the relation between instrument readings and gaseous compositions are given for the following gas mixtures: 0-100% Argon in air; 0-20% Carbon Dioxide in air; 0-100% Helium in air; 0-100% Hydrogen in Nitrogen; 0-100% Carbon Dioxide in Air; 0-5% Hydrogen in Air; 20.9-100% Oxygen in Nitrogen; 0-35% Ammonia in gas composed of 60-80% Hydrogen in Nitrogen; 0-25% Sulphur Dioxide in Air. The features of the apparatus are threefold: Speed, Accuracy, and Continuous or Intermittent readings are available with a minimum of dependence upon the human element. Wiring diagrams and schematic construction of the apparatus are shown, and the features of incandescent lamps, commercially available, which make them operable for precision Wheatstone's Bridge work, are discussed. Examples given show the general application of the apparatus to problems of gas analysis, which would be very difficult to accomplish by ordinary methods. *—R. H. Krueger and W. F. Hamilton before American Chemical Society, Aug. 30-Sept. 4, 1931.*

Water Gas Production

Digest of Report of Water Gas Committee presented before 1931 Meeting of Pacific Coast Gas Association Gives Interesting Operating Results

Water Gas Production in Seattle

W. R. ALEXANDER
Seattle Gas Company

THE Seattle Gas Works has six U. G. I. Generators, five nine foot and one eight feet six inches. One nine foot set is operated by a model "A" U. G. I. automatic control; two nine foot sets are operated by model "B" U. G. I. automatic controls; one nine foot set is hand hydraulic operated; one nine foot set hand operated and one eight foot six set hand operated. None of these sets are equipped with back run.

At the present time we are using coal mined at Bellingham, Washington, and Occidental coal mined at Bayne, Washington, in the proportion, 2/3 Bellingham Nut and 1/3 Occidental Nut. We find that at this mixture our generator fuel per M. is the lowest and the B. T. U. value of the blue and blow run gases is a maximum.

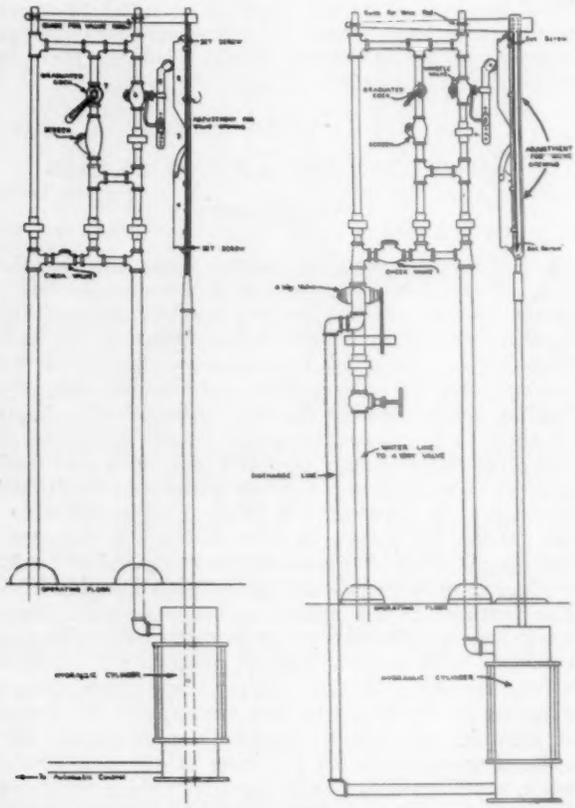


Fig. 1—left, Generator Blast Valve Control; Fig. 2—right, Hand Operated Generator Valve Control. Seattle Gas Company

These coals have been used for a number of years by the Washington Gas & Electric Company, who have developed the water gas process with the back-run to a high degree of efficiency. The coals are sub-bituminous and contain a high percentage of volatile matter and ash which does not recommend their use as efficient generator fuel. Economic conditions, however, have made it profitable to use this comparatively low grade fuel.

Analysis of Coals

Occidental Nut		Bellingham Nut	
Moisture	.14	Moisture	1.60
Vol. Matter	36.61	Vol. Matter	40.29
Fix. Carbon	44.11	Fix. Carbon	38.38
Ash	19.14	Ash	19.73
	100.00		100.00

The oil used is Union Diesel with Gravity of 27 degrees plus and has the following analysis:

Sp. Gr. @ 60° F. .8781—29.6 A. P. I.
Color—Very dark brown.

Temp. of Distillation	Percent By Vol.	
440 to 500	14.4	Oil 300 to 500—14.4%
500 to 550	28.6	
550 to 600	21.2	Oil 500 to 650—62.8%
600 to 650	13.0	
650 to 700	8.7	Cracked 780°F 95.5% over
700 to 780	13.1	
Total	99.0	
Coke Res.	0.30% by Wt.	
Sulphur	0.44% by Wt.	
	Percent By Vol.	
Olefines	18.7	
Aromatics	17.1	
Naphthenes	20.6	
Paraffins	45.6	
Available for Gas Enrichment	70.0%	

Operating Procedure

Clinkering leaves about six to eight inches of fire on grates. The first charge is 3200 lbs. of coal, after which the ash pit door is left open 15 minutes. We find by so doing that the fire is more uniform and contains less blow holes. We operate on a four minute cycle. We find that on a 5 minute cycle the blow is too long, over heating the hot valve, and 3 minute so short that the high rate of blast necessary produces blow holes in the thin fuel bed.

Using 35" of blast pressure with a generator blast control device maintains 4200 cubic feet of air per

minute. Figure 1 shows the blast control as applied to automatic control and Figure 2 as applied to hand hydraulic operated sets. The essential difference between these controls is that in the automatic operation, the generator blast valve is started by the master control valve while in the hand hydraulic operation, the generator valve is started by manually operating the four way valve shown in Figure 2.

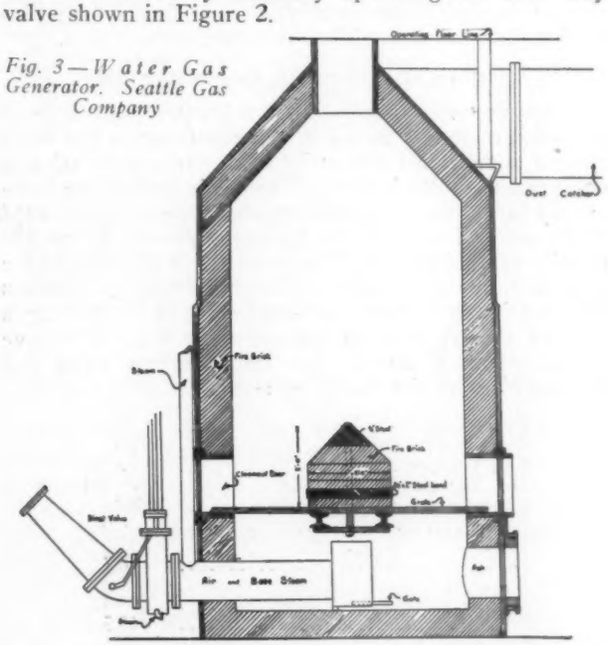


Fig. 3—Water Gas Generator. Seattle Gas Company

Referring to Figure 1, when rod 1, which is an extension of the generator blast valve stem, is set in motion by the master valve, it travels full speed due to valve 6 being held wide open by roller 5 being in contact with cam 2. Cam 2 and roller 5 are set at such a position that the generator valve will open wide enough to admit air at a given rate through the fire when roller 5 drops into space 3. All this operation is started before the carburetter blast valve opens. Rod 1 travels upward very slowly through space 3 because valve 6 is closed and the water to operate the hydraulic cylinder must pass around through graduated cock 7. While rod 1 is traveling through space 3, the carburetter blast valve is opened by the automatic master valve. In order to maintain sufficient air through the fire, the generator valve must now open wide and this is accomplished by roller 3 making contact with cam 4 to open valve 6 again.

Cams 2 and 4 and roller 5 may be adjusted to any desired position and graduated cock 7 may be set so that rod 1 moves through space 3 at any desired rate. By properly adjusting this control, a given rate of blast may be maintained through the fire from the beginning of the blast. The chief advantages of this control are that it prevents over blasting of the fire at the beginning of the blow and keeps down the formation of side wall clinkers and blow holes in the fire. The problem of keeping blow holes out of the fire is very important in bituminous operations with a small sized fuel because it is necessary to carry a very thin fuel bed.

Our automatic is set for a 25% blow and 75% run. Our stack valve closes at 12% of the cycle making 13% blow run. The remainder of the cycle is made up of 10% up run, 50% down run and 15% up run at the end. After clinkering, the start is made by blasting 3 minutes then making 3 minutes blow run. Second run, 3 minute blast and 2 minute blow run. Third run, 3 minute blast and one minute blow run. Fourth blast brings set up to temperature which is about 1450° F. at base of superheater. Before the run we charge 1600 lbs. coal. After charging, we go immediately on the run making a straight up run. This has cut our smoke about 50%. 1600 lbs. of coal are charged every 5 runs, until generator is half full. Then the charge is 800 lbs. every 7 runs.

Operating Results

To arrive at our present method of operation, experiments were conducted without the use of the blow run, with the maximum amount of blow run possible; and with one-half the maximum blow run. The results are tabulated below.

	Without Blow Run	½ Max. Blow Run	Max. Blow Run
Percentage make blow run....	0	33	52
Pounds coal per M.....	49	41	33
Gallons Oil per M.....	3.00	3.50	4.00
Gallons Tar per M.....	.620	.715	.831
Capacity of set per Hr.....	38000	55000	75000
Estimate B.T.U. blue gas and Blow run gas mixture.....	350	257	228
CO_2	5.5	7.3	6.8
Ill.	7.4	9.5	11.2
O_2	0.3	0.2	0.7
CO	24.4	15.5	15.0
H_2	26.1	14.4	14.9
CH_4	17.9	19.1	14.3
N_2	18.4	33.9	37.1
Sp. Gr. (Effusion Apparatus)..	.666	.790	.825
B.T.U. (Thomas Calorimeter)	513.	508.	501.
B.T.U. per gallon of oil.....	54.3	72.1	68.2

These results show that by the use of the maximum amount of blow run the generator fuel per M is reduced from 49 lbs. to 33 lbs.; that it was necessary to raise the oil per M from 3 gallons to 4 gallons; and that the make per set hour was increased from 38 M to 75 M. From a cost standpoint, the saving in generator fuel and labor due to the fact that a smaller number of sets are operated when using the blow run much more than offsets the increased cost of oil used.

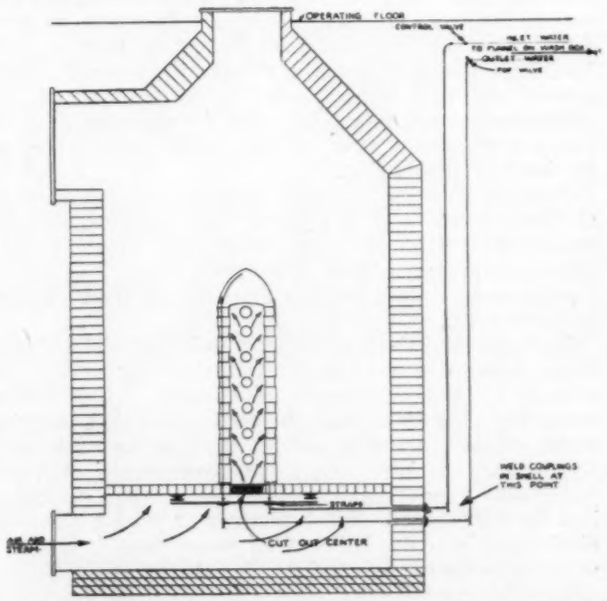


Fig. 4—Water Cooled Air and Steam Nozzle. Seattle Gas Company

The specific gravity of the gas with the maximum amount of blow run appears high but since one third of our send-out is oven gas, the specific gravity of the mixed gas is reduced to 0.73.

To overcome the problem of blow holes and shrinkage from the wall we have recently tried piers of various heights and diameters and find that due to the very thin fuel bed a pier such as shown in Figure 3 to be the most satisfactory. This pier is built of non-abrasive fire brick and is 24" in diameter and 24" high. It is capped with a conical shaped piece of steel and is held together by a bolt vertically through the center and a band of strap iron horizontally around it. The above results, however, are without use of a pier. Piers used in the East on the same size sets are over twice as high as the one we are using, but Eastern operation uses larger fuel which permits a much thicker fuel bed. We have just installed a Paff Air and Steam nozzle shown in Figure 4. This nozzle consists of a cast steel tube placed in the exact center of the generator and checked by measuring the distance to the side wall at four points 90 deg. apart. On the bottom of the nozzle will be noticed two openings for the water pipe connections. These pipes must be run down between the grate bars and if there is not sufficient room for them it may be necessary to cut grooves in the grate bars to accommodate them. By moving the nozzle clock-wise the best location can be found which will necessitate the least amount of cutting the grate bars.

Locating Water Pipes

It is next necessary to select the most convenient location for running the water pipes through the shell of the generator. Cut out the generator lining at this point and cut two openings in the shell a reasonable distance apart by means of an acetylene or electric torch or otherwise. These openings should be just below the lower level of the grate bars, allowing sufficient clearance for the union connections on the two water pipes. Weld pipe couplings of the required size into the openings, being sure to keep them in perfect alignment with the nozzle. After plumbing the nozzle and making sure that it is exactly vertical, connect up the two pipes as rigidly as possible, since they are the only means of holding the nozzle in place. In case the nozzle does not set perfectly level on the grate bars it may be necessary to level it by means of thin iron shim on the low side. Next extend the two water pipes on the outside of the generator upward to a point near the charging floor or above it placing a valve on the smaller pipe which is the inlet or supply line.

A constant supply of water is absolutely necessary at all times when there is a fire in the generator. If the water supply fails for even a short time when the machine is in operation there is always a danger of damaging the nozzle. It is nothing more or less than a boiler in that respect.

The source of the water supply is immaterial and not much pressure or head is necessary, as long as there is enough to insure constant circulation. Circulating water from the tar well can be used and in that case the outlet or discharge pipe can be run into the wash box. By checking the inlet valve to the nozzle sufficiently, the water will be converted into steam and can be discharged into the atmosphere. When pure water is used it can be discharged into the boiler feed water heater, or converted into steam and run into the exhaust steam system where this may be desired. The over-flow from the condensors makes a very good and constant supply of water. In plants having a gas holder with the tank above the ground, this makes a very good source of supply.

The amount of water required varies from 2 gallons to 5 gallons per minute, depending on the size generator and the outlet temperature of the water. As stated this temperature is controlled by means of the valve on the inlet or supply line to the nozzle.

It is claimed by the manufacturers of this nozzle that it will materially reduce the amount of air required per M cubic feet of gas made. In two months' operation we have not shown any material reduction in the amount of the air required. However, the nozzle does reduce clinkering time because clinkers will not adhere to it.

Feeding Oil Through Generator Fire

When the price of gas oil is low it often pays to spray a portion of the oil used into the generator on the down run of a split run set or into the carburetter of sets equipped with Back Run. The oil is broken up completely into carbon and hydrogen and the carbon is used as generator fuel while the hydrogen lowers the specific gravity of the blue gas. The recent wide adoption in the East of Bunker "C" oil to replace the lighter gas oils has resulted in the almost universal method of feeding a part of the oil through the generator fire. We have recently started this method of operation using our regular oil with the following results:

Percentage make blow run	52%
Pounds coal per M	30.
Gal. Oil per M	3.85
Gal. Tar per M	.851
Capacity set per lb	75000.
CO_2	6.0
Ill.	11.4
O_2	0.7
H_2	19.3
C_o	15.0
CH_4	15.5
N_2	32.1
Sp. Gr. (Effusion Apparatus)	.800
B.T.U. (Thomas Calorimeter)	503.

It will be noted that the specific gravity of the gas has been reduced by the introduction of a part of the oil into the generator on the down run. While increasing the capacity of the sets and utilizing the volatile coal by means of the blow run, we have always been confronted with the higher specific gravity of gas which has a number of disadvantages. We have not completed experiments with the introduction of oil into the generator in the down run but believe this will be a means for more economical operation and better service to our customers.

Carbon Briquets As Generator Fuel

H. M. THOMAS

Gen. Mgr., North West Cities Gas Company, Walla Walla, Washington

THE carbon briquets used are manufactured by the Portland Gas and Coke Company from lamp black which is a residue of oil gas manufacture. The briquets are cylindrical in form, 2½ x 2½ in size, and when seasoned are especially hard. The proximate analysis of this fuel is:

Moisture	3.4%
Volatile Matter	8.7%
Fixed Carbon	87.6%
Ash	.3%
Sulphur	None
B.T.U. per Lb.	15,800

The cost per ton is considerably in excess of coal; however, many items of saving result from their use as fuel and must be considered in the final analysis. In our case with the particular plant in question, we have

not been able to find a coal that will compete when all such factors are considered.*

We have two sets, each having 5′ 6″ x 12′ generators; 5′ x 12′ 6″ carbureter and 5′ x 22′ superheaters. The standard practice of checkering is followed. The cycle of operation, due to operating but one shift with a minimum crew fluctuates with local plant conditions, but on the average is: three minute blast, one minute blow run, two and one-half minute steam run and one-half minute purge with a split or down run every three or four runs, varying with the condition of the fuel bed, of three minute blast, one minute down steam, two minute up steam and one-half minute purge. With an average daily send out of 180,000 cubic feet for the past six months 28.8 lbs. of briquets and 4.6 gallons of 24 plus diesel oil was used per thousand cubic feet of gas produced.

One of our water gas sets is equipped with the Young and Whitwell back run and during the past ten years this generator has run from eight to ten hours daily, being shut down only for the purpose of recheckering and cut in again immediately after the work was completed. The first lining repair, and that of a minor nature, was made in February of this year, after ten years of almost continuous operation. This long life is partially due to absence of clinkers and the lack of dust or carry over of small pieces of fuel. The machine keeps clean at all times, resulting in no back pressure, permitting maximum capacity and long life of both shell lining and checker brick.

Influence of Heavy Fuel Bed

Briquets give the best results when a heavy fuel bed is maintained. Five feet, in our case, being the minimum and from that to seven feet, or practically even with the off take, is the general practice. Absolutely no ashes or clinkers are formed, permitting continuous operation with no shut down periods for clinkering, effecting a large saving in machine, time and labor over coal or coke fuel. A few small particles of the fuel fall through the grates; these are cleaned out each night by the night man, mixed with fresh fuel and used again the following day. The grates will last indefinitely if care is taken to keep them covered with a few inches of dead fuel. The shape of the briquets prevents packing and permits free air passage throughout the entire bed, producing an even fire, perfectly distributed heat and no blow holes.

A test was made at our Lewiston Idaho plant by mixing briquets with Utah coal; however, through a failure of coal delivery the test was too short to obtain sufficient data on which to base a conclusion. We did determine, however, that the fuel burned more evenly, the clinkers were much lighter and easily removed, and we could operate longer periods without a shut down for clinkering.

We have found carbon briquets, through ease of operation, saving in maintenance, low labor costs and results obtained, the perfect water gas fuel. Even though the initial cost of this fuel is high, we believe that any company operating water gas sets sufficiently close to a source of supply can well afford to give this fuel due consideration. Particularly is this true of those plants where generator capacity is limited and additional labor is required for short extra shifts.

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* *Cost of operation using carbon briquets as fuel were given in a paper presented by Mr. F. C. Hawks at the Pacific Coast Gas Association convention in 1926.*

Water Gas Operation in Spokane

R. A. HOFFMAN

Asst. Engr. Spokane Gas & Fuel Company

THE major portion of the gas manufactured in Spokane is coal gas, so that water gas is made only when the sendout exceeds 950 M cubic feet. This is necessary at least during the six coldest months of the year.

The sendout gas is 450 B.t.u. and is made up of about 82% coal gas and 18% blue gas except when our load increases to above 1100 M cubic feet. Then the percentage of blue is increased and, in order to maintain our B.t.u., we resort to oil.

During the month of January, 1931, our sendout was large enough only on five days out of the thirty-one to require the use of oil. So it is seen that most of the water gas made in Spokane is uncarburetted. With this in mind, it will, perhaps, be easier understood why we operate as we do and especially since oil costs us 7c per gallon in Spokane.

The water gas plant of the Spokane Gas and Fuel Company consists of the following:

One nine foot carburetted water gas set using the Lowe Process, and one six foot six, two shell blue gas set equipped with an oil spray in top of generator. There is a steam turbine driven blower for the 9′ set and an electric driven blower for the 6′-6″ set. The Turbo blower can be used with the 6′-6″ set but the electric blower cannot be used with the 9′ set since it is too small. An oil pump and oil heater are piped so that they can be used on either set.

The 6′-6″ blue gas set is operated as follows: Six runs per coking, five minute blast on coking, alternate two minute and one minute blasts before alternate four minute upruns and downruns, the first run on a coking being an uprun. The fuel used is coke, 450 lbs., on the dry basis being used per coking. When oil is used, it is introduced only on an uprun and into the top of the generator.

The blue gas machine, Figure 5, is so constructed that the gases on the uprun flow from the top of the generator into the bottom of the superheater, then up through superheater and into washbox. When no oil is used, steam for the downrun is introduced in the top of the superheater but, when oil is used, we found it necessary to introduce the steam for the downrun into the top of the generator. Otherwise, the checker brick would not be hot enough to completely gasify the oil during the uprun without getting the generator fire excessively hot with a consequent waste of fuel.

Forty pounds of coke per M of blue gas made are used and the proximate analysis of our coke is as follows:

	(Dry basis)
Moisture	
Volatile	3.9%
Fixed Carbon	77.4%
Ash	18.7%
Total	100.0%

The average gas made per run is 2050 cubic feet.

We do not have an air meter or a flow meter so that the amount of air used is not known.

The amount of steam per thousand is not known for the same reason.

We are able to make up to eighty runs before it is necessary to clean fire and 30 to 45 minutes are required for cleaning fire.

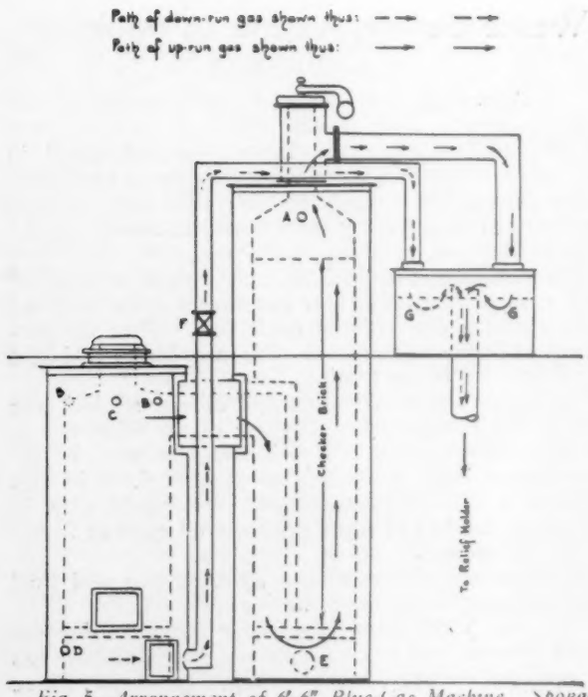


Fig. 5—Arrangement of 6'-6" Blue-Gas Machine. Spokane Gas & Fuel Company

A—Steam for Down-run when Oil is not used. It is admitted in both sides of Superheater
B—Steam for Down-run when Oil is used
C—Oil Spray. Oil is admitted on up-run only
D—Steam for Up-run
E—Air-blast Entrance for Superheater. Air-blast entrance in bottom of Generator not shown
F—Down-run Valve. This valve is closed when up-runs are made
G—There is a valve arrangement in wash box which is used to close either gas inlet, depending on whether an up-run or a down-run is being made. Details not shown

An analysis of our straight blue gas is as follows:

CO_2 equals	12.6%
Ill. "	0.0%
O_2 "	1.2%
CO "	23.0%
H_2 "	43.0%
N_2 "	20.2%
Total	100.0%

When using oil, the analysis is:

CO_2 equals	8.6%
Ill. "	3.0%
O_2 "	0.6%
CO "	24.8%
H_2 "	45.0%
N_2 "	18.0%
Total	100.0%

This is a 450 B.t.u. gas requiring 2.1 gallons of 27° oil per M.

Unit costs of our blue gas are as follows:

Cost of coke per M.	$.14
" " steam " "	.045
" " labor " "	.06
" " power " "	.004
" " misc. supplies per M.	.001
" " maint. per M.	.008
Total cost of the 300 B.T.U. blue gas per M.	$.258
Cost of oil per M.	.147
Total cost of the 450 B.T.U. carburetted blue gas per M.	$.405

Backrun Equipment

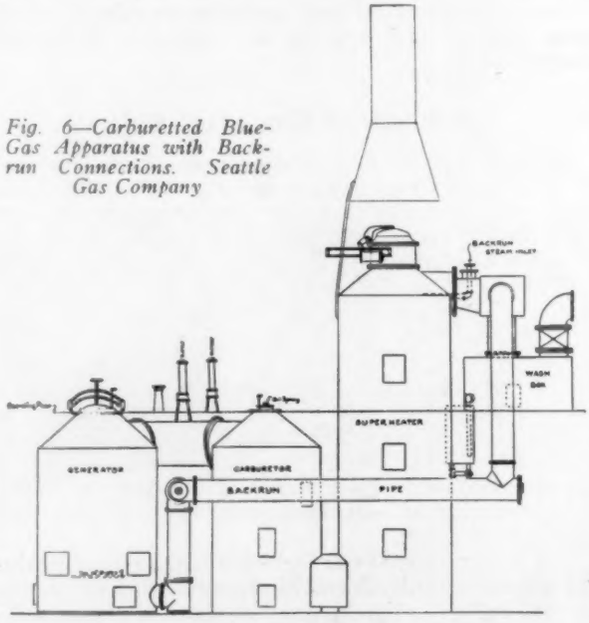
C. P. JOHNSON
Gas Engineer, Puget Sound Power & Light Co., Bellingham, Wash.

IN 1926, a six foot Steere Backrun water gas machine was installed at the Bellingham plant. As the backrun device is part of the original set no comparison can be made with the set without this equipment.

Figure 6 shows in a simple manner the equipment for the backrun operation. Instead of a down run, as in the ordinary water gas set, the steam is introduced into the gas offtake at the superheater and becomes superheated while passing down through the superheater and up through the carbureter before entering the top of the generator. The blue gas formed by reaction with the fuel in the generator passes off from the bottom of the generator through the backrun pipe to the wash box.

The machine is manually controlled with hydraulically operated backrun valve and stack valve and operated on a five minutes cycle of two minute blow and three minute run. There are six runs per charge of 500 pounds, with blow runs for 30 seconds on the first and second runs, 20 seconds on the third and 15 seconds on the fourth. The machine is run as an average, 10 hours per day with a make of 22,500 cu. ft. per hour and 2,010 cubic feet per run.

Fig. 6—Carburetted Blue-Gas Apparatus with Backrun Connections. Seattle Gas Company



The gas obtained has a heating value of about 505 B.t.u. and the following is a typical analysis:

CO_2	7.2%
O_2	0.4
CO	23.6
ILL	7.1
H_2	27.2
CH_4	12.8
N_2	24.7
	100.0

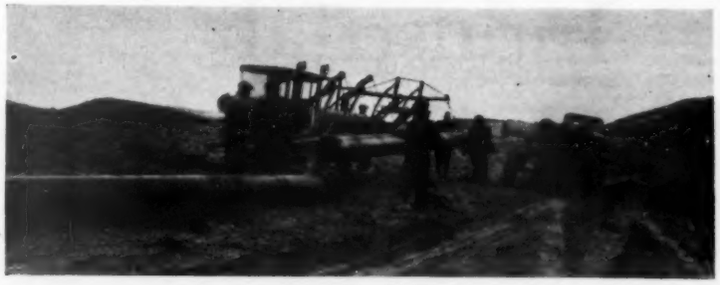
The generator fuel is straight bituminous coal, obtained from the local mines of the Bellingham Coal Mines with the following analysis:

Moisture	6½%
Volatile matter	40
Fixed carbon	39
Ash	14½
	100% B.T.U. 11,200

(Continued on page 57)

The Use of Master Equipment in Pipe Handling

C. W. GEIGER



Special Pick-up Equipment for Handling Pipe Sections

ONE of the newest items of pipe handling equipment is that known as the Master equipment. Although the main frame and lifting apparatus are the same in every case, several variations of the method of attachment have been developed to suit the preference of individual purchasers.

At present there are three types of attachments for pipe handling. One consists of two arms which are thrust under the body of the pipe, the pipe being lifted and transported to position over the trench and then lowered on the cross ties. This type of lifting device seems to work fairly well on level country, but does not work so well in the hills, especially when carrying the pipe down hill over rough ground. Obviously, with this type of lifting arms, it is necessary that the tractor be placed at the center of the pipe to be lifted. Lifting arms of this do not lend themselves so readily to picking a length of pipe out of the pile. They work to the best advantage when picking pipe off the ground and placing it over the trench.

The second type consists of a pair of tongs at the end of the spreader bar. This type works better in rough country, but is not so readily used when picking pipe out of a pile.

The third type consists of a spreader bar through which cable is run and has hooks on the end of the cable which attach to the end of the pipe. Some operators like the third type the best. They say that this type is most efficient in rough country and lends itself easily to picking pipe out of the pile. Not so much care is required in spotting the tractor at the center of the pipe, since the cable is fixed and naturally adjusts the position of the pipe with reference to the tractor. When using this type of lifting device, it is advisable to have the front of the radiator properly guarded when carrying pipe over rough ground, as any swinging motion is likely to bring the pipe in contact with the radiator.

Caterpillar Tractor with A-frame Lowering Pipe in Trench

After the pipe has been laid in the trench, the same equipment is used for backfilling. The lifting arms are removable and a backfiller blade or bulldozer blade can be mounted on the front end of the frame.

Pipe lines are, at best, expensive to construct, which emphasizes the importance of building in as direct a line as possible. Caterpillar type tractors are especially useful on these lines, which do not follow beaten paths, for hauling pipe and construction materials from the railroad to destination. After the pipe is brought to central points along the line by trucks, tractors are used to string out the pipe or spot it in single lengths.

Pipe trenches invariably follow the contour of the ground, so that it is necessary to bend the pipe in order that it will lie in the bottom of the ditch, parallel to the ground surface. Advantage is taken of the tractor's weight and ability to maneuver into almost any position for the purpose of thus bending the pipe. There are numerous methods of bending pipe, the simplest being to lay a length of pipe crosswise of a depression in the ground and maneuvering the tractor so that its weight rests atop of the middle of the pipe section, bending it down. Another method is to hold the ends of the pipe down, with the tractor lifting up in the middle with a cable and block suspended from a pipe boom.

After the trench is prepared, the pipe is spotted on supporting cross timbers over the center of the trench. Welding together of the sections then takes place, and after a sufficient number of lengths have been joined together, it is ready for lowering into the trench. A single drum hoist and boom mounted on the side of a tractor then picks up the pipe sufficiently to remove supporting timbers, after which the pipe is lowered into the trench. Some of the tractor-mounted pipe booms are equipped with a backfiller as well

Boom type back fillers are operated by two cable-winding drums mounted on the side of the tractor. The cable from one drum leads direct to a scraper and pulls the load of earth. The other line leads to a block in the end of the boom and thence back to rear of the scraper. This line pulls the empty scraper back for another load of earth. The side mounted pipe boom is also invaluable around material storage depots for loading and unloading trucks, sorting the pipe and general handling of materials, such as valves, expansion joints, etc. Booms which swing sideways and also that raise and lower are particularly adapted to use around storage yards, because of their ability to spot the load.

Industrial Furnaces for Gas

VIII - Forging - Rivet Heaters

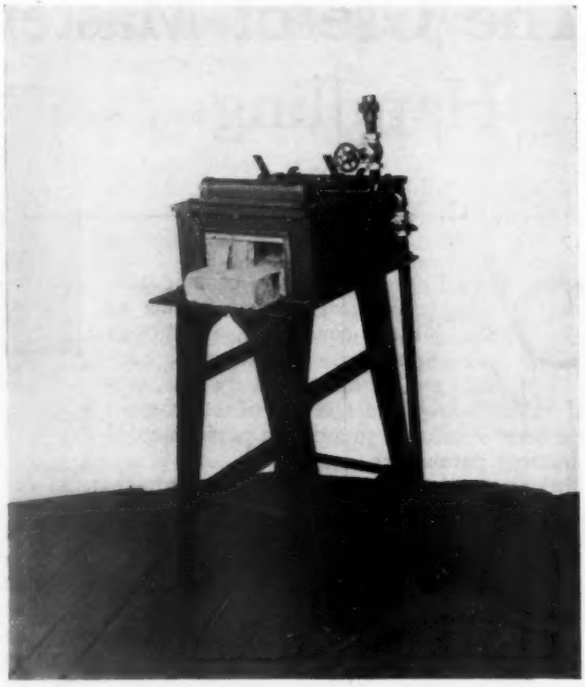
LAWRENCE E. BIEMILLER

Supervisor, Fuel Sales, Consolidated Gas Electric Light & Power Company of Baltimore

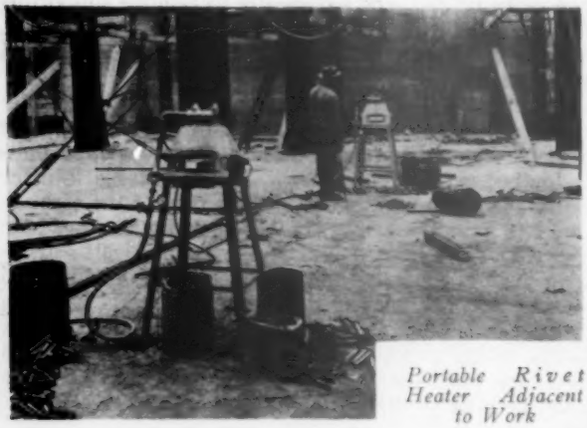
FORGING is one of the most ancient operations performed in connection with metallic substances, and is at the same time one of the most important types of modern heat treatment. Forging can best be defined as the heating of a metal, usually steel, beyond its plastic point, with subsequent mechanical working. Because this is an operation which has been performed for such a long time there is a great tendency to regard the heating for forging as being a crude heating operation. But recently it has become more widely recognized as a refined heating operation worthy of the most exact atmosphere and temperature control. The main reasons for forging steel are:

1. To reduce a block of metal to the approximate dimensions of the finished article, in a manner so that it will possess desired physical characteristics.
2. To refine the coarse grain of a steel ingot.
3. To orientate unavoidable inclusions in metal so that they will have minimum injurious effect.

Any heat treatment process which does not involve thorough consideration and control of the initial forging operation is incomplete. Heat treatment begins with the heating of steel preparatory to forging and ends with the final cooling following the last heat treatment operation. The heat treatment specialist cannot be expected to get out of a piece of steel or to put into it something that the forge heater has taken out by improper heating operations in the forge shop. Present day investigation clearly shows the necessity of improved methods and equipment for heating in the forge shop.



Individual Rivet Heater



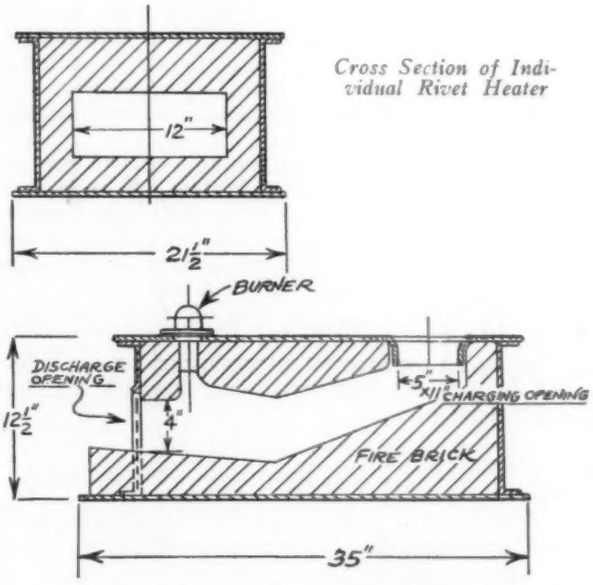
Portable Rivet Heater Adjacent to Work

The weak links in forging practice are the lack of uniformity and temperature of various heats. As a rule the temperatures are too high with the result that while the surface is apparently hot there may actually be a "bone" on the inside. It is common practice to see drawn from a furnace a billet that will drip, and yet when placed under the hammer there will be indications of lack of heating inside. It is the inside, not the outside, that determines the physical properties of the final forging.

Forging Temperatures for Different Steels

Steel should be heated to different temperatures depending upon its constitution. Plain carbon and alloy spring steel will be heated to about 1850°, held there only long enough to permit heating throughout, and then worked. Nickel and nickel chromium steels may be heated to only 1650°, whereas the usual temperature to which steel is heated for forging will be over 2000° F. Heating should be done with a soft non-cutting flame, to avoid excess loss by scaling and risk of burning the metal. The idea is to maintain the temperature of the furnace as near as possible to that actually required to soften the steel enough for proper working with the hammer or press available, and to give plenty of time in the furnace for the steel to soak thoroughly. For plain medium carbon steel allow 1 hour per inch of thickness for heating up from cold, and ¼ hour per inch of thickness for soaking at the desired temperature. The furnace should have enough burners to get even heat dis-

tribution, and every cubic foot of air entering the furnace must be under control. Successful forge furnace operation requires continual supervision, particularly to check the temperatures and time of heating.



Cross Section of Individual Rivet Heater

The increasing recognition of these facts will broaden the field for the use of gas for forging. At the present time oil is in high favor for forging because of the rapidity with which many oil-fired forges heat to high temperatures. In many cases this heating is being done too rapidly for the good of the forging, and it is being burnt. At the present time there is a tendency to favor oil because of the quality of the scale resulting. It is a heavy scale but one easily removed, whereas that resulting from the use of gas is sometimes more adhesive. The latest researches with diffusion flame burners on gas forges seem to show:

1. Gas heats as fast or faster than oil.
2. Steel can be produced without scale.
3. Thermostatic control is applicable.

It is quite probable that the next few years will see forging become one of the closely controlled, highly scientific heat treating operations, for which the advantages of gas fuel will be more generally recognized for forges of all sizes.

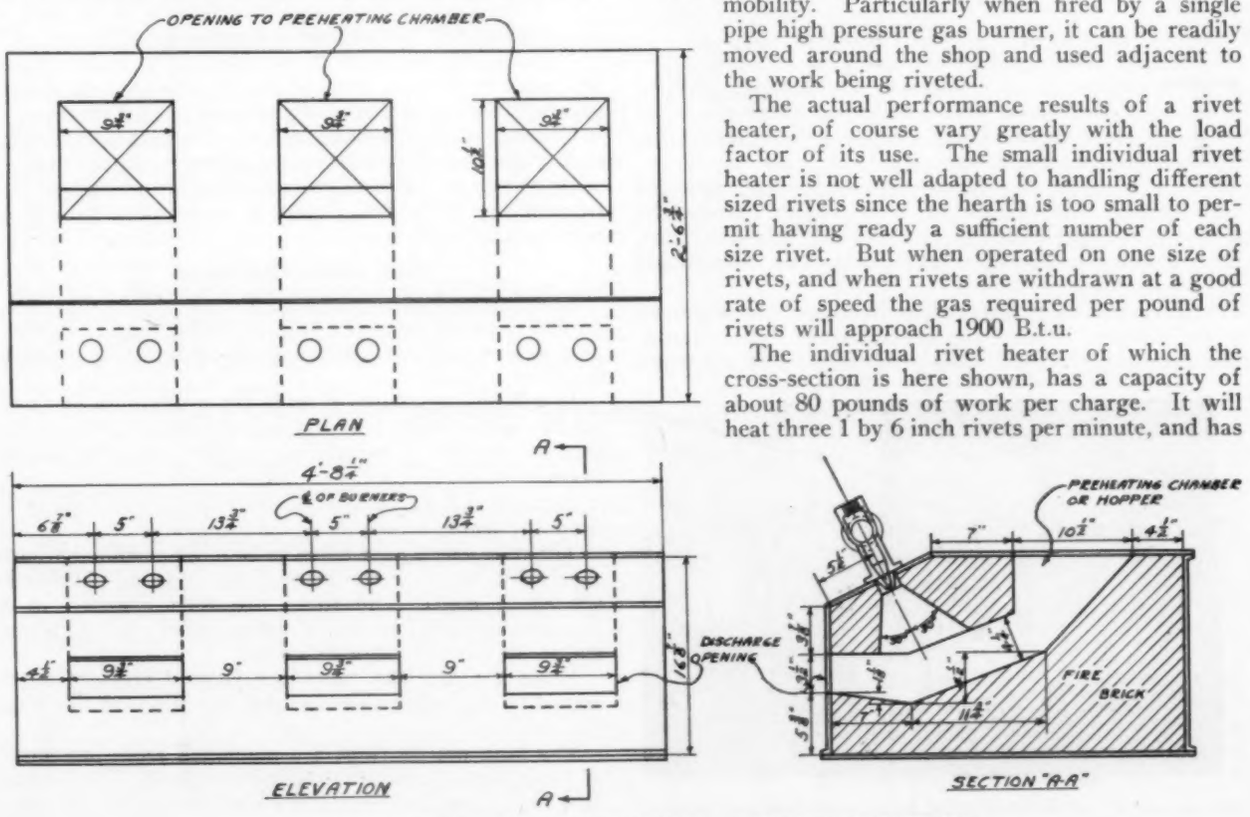
Rivet Heaters

A forging operation, though often not recognized as such, for which gas is very well adapted and extensively used, is rivet heating. In the average gas rivet heater the flame is directed downward on the work, and the work is heated by direct contact with the gas flame. This results in very rapid heating so that no scale is formed. A very popular gas fired rivet heater is a relatively small individual furnace which is used to heat a small number of different sized rivets, or a large number of rivets of the same size, at a high rate of production. This furnace is light and as a result comes to temperature quickly. It has no insulation, but a lining several inches thick of highest quality firebrick. The use of insulation would result in a longer time being required to come up to operating temperature, and in a materially decreased refractory life. Due to the small size of the heater, and relatively large openings in it, the fuel saving possible would be relatively small. The rivets are charged through an opening in rear of the top, and the rivets are removed individually through the front opening.

A great advantage of the gas fired rivet heater is its mobility. Particularly when fired by a single pipe high pressure gas burner, it can be readily moved around the shop and used adjacent to the work being riveted.

The actual performance results of a rivet heater, of course vary greatly with the load factor of its use. The small individual rivet heater is not well adapted to handling different sized rivets since the hearth is too small to permit having ready a sufficient number of each size rivet. But when operated on one size of rivets, and when rivets are withdrawn at a good rate of speed the gas required per pound of rivets will approach 1900 B.t.u.

The individual rivet heater of which the cross-section is here shown, has a capacity of about 80 pounds of work per charge. It will heat three 1 by 6 inch rivets per minute, and has



THREE CHAMBER RIVET HEATER

a maximum burner capacity of about 200,000 B.t.u. per hour. It heats up from cold in about 30 minutes, and a rivet reaches driving temperature in about 5 minutes in a hot furnace. Where a constant production of different size rivets is required, it is advantageous to have either several individual heaters, or one larger heater with several chambers for the different sized rivets. A cross-section is shown of a three chamber rivet heater, which gives the operator great flexibility.

Advantages of Gas Fired Rivet Heater

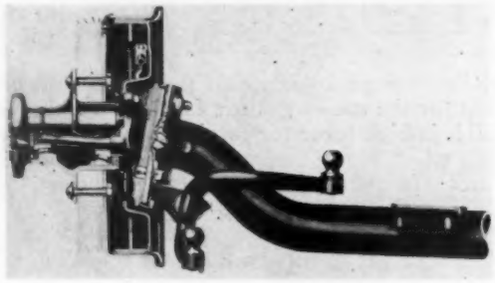
The gas fired rivet heater has a distinct advantage over the oil fired heater, that of materially reduced scale. The less the scale the smaller the number of rivets which will be found loose after they are driven. The gas heated rivets, if heated to the correct temperature, with exact temperature control, and if not heated too rapidly will have greater strength than an oil heated rivet. Present rivet heating practice with oil, in the structural steel industry, is to heat too quickly, and to temperatures which are too high on the outside of the rivet. If the standards of the A.S.S.T. and other organizations considered rivet strength, materially less rivets correctly heated in a gas furnace, could be used for a given bit of fabrication. When an oil fired rivet heater is found operating at 2200 or above, as many are, one can be assured of turning out much stronger rivets with a gas rivet heater operating at 1900 to 2100, preferably the former. The same advantages of reduction in scale and more uniform heating apply to gas rivet heaters when compared with resistance type electric rivet heaters.

Up to now automatic temperature control has not been applied much to gas rivet heaters. With increasing recognition of the rapid heating, small amount of scale, high quality of rivet, and flexibility of use, we may look for more extensive application of gas fired rivet heaters. The industrial gas engineer can greatly increase the use of gas for rivet heating if he can sell his prospects on the desirability of their using rivets with the greatest strength, such as can be obtained in well designed, and well operated gas fired rivet heaters.

Heat Treating Tubular Axles

I. W. SPRINK

Chief Engineer, Logan Gear Co., Toledo, Ohio

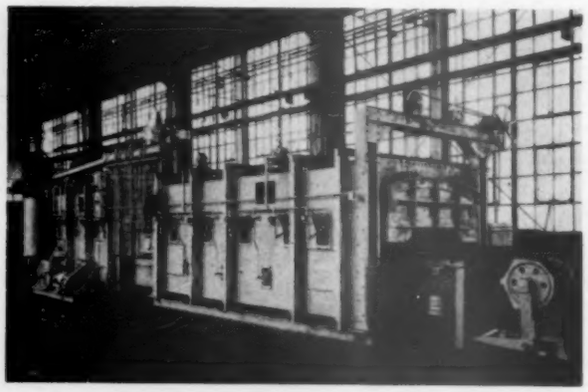


Tubular axle and assembly

THE automotive industry has been largely responsible for the specialized development of many innovations in continuous heat treating processes and methods.

Heat treating requirements have progressed step by step with the development of the automobile. Constant changes in design, the demand for more speed, dependability, precision in automobiles, have made these developments imperative.

One of the most interesting of recent developments is the Reverse Elliot Type tubular front axle. Before this axle could be made on a production basis it became necessary to design and develop new and special apparatus, chief of which was that used in heat treating.



Charge end of combination normalizing and hardening furnace, where axles are placed manually on conveyor

Control of furnace atmosphere during heat treating operations had to be close enough to permit the attainment of proper physical characteristics to withstand the tremendous intermittent shocks and strains to which the front axle is subjected.

Difficulties Overcome

The Logan Gear Company, Toledo, Ohio, has succeeded in overcoming the inherent difficulties of tubular axle design and are producing axles of this type on a production basis.

It will be interesting to trace the production of these tubular axles which are destined to replace in many instances the more expensive, heavier, drop-forged I-beam type.

Straight S.A.E. 1040 H.K. Seamless Steel Tubing is used for manufacture.

The tube lengths are taken to bending machines where the double bend for necessary drop is put in. All bends are made cold. The tubes are then clamped in a specially designed sawing machine where the ends are cut at the desired chamber angle.

From the saw the tubes are formed and cut automatically in preparation for the reception of the king pin bearing.

The king pin bearings are machined from bar stock of lower carbon content than the tube itself. This separate unit is pressed into place and welded in the tube ends before going to the heat treat.

The axles are now placed on the conveyor of the combination normalizing and hardening furnace. This furnace was specially designed for the work by the Surface Combustion Corporation, Toledo, Ohio, in conjunction with the Logan Gear Company engineers.

It is of the continuous Chain Conveyor type, gas fired, with a capacity of 50 axles per hour from cold to normalizing temperature of 1650° F. and a hardening temperature of 1470° F. The capacity of the furnace is limited by quenching capacity, rather than by limitations of the furnace itself. The hearth width from wall to wall is approximately 5 ft. 6 in. Hearth width available for work passing through the furnace is 54 in. The length of the normalizing furnace inside from wall to wall is approximately 13 ft. The hardening unit is approximately 9 ft. in length. The cooling chamber between units is 6 ft. long. The entire combination normalizing and hardening machine occupies a floor space of 33 ft. long by 9 ft. wide.

The furnace is fired with high pressure automatic proportioning 2 stage velocity burners, firing above and below the hearth for the entire length of the furnace. City gas of 570 B.T.U. content at 10 lbs. pressure is utilized as fuel. Automatic recording controls and self proportioning inspirators are responsible for the fine metallurgical attainment required for maintaining the high physical characteristics necessary in the product.

Normalizing Process

The tubular axles first pass through the normalizing zone on alloy steel chains, spaced on 30 in. centers, that ride in turn on alloy channels. The tubes are raised to normalizing temperature of 1650° F. and hold at this temperature for a period of time to insure thorough normalization. They then pass into the water cooled chamber where the temperature of the work drops just below the lower critical range point.

From here the work progresses to the reheating zone where it is brought to the proper temperature for quenching.

The furnace material handling mechanism is timed and synchronized to the capacity of the patented quenching machine, located at the discharge end of the combination normalizing and hardening furnace.

The conveyor is so timed that when quenching operator removes an axle from the conveyor, another axle is automatically brought from the furnace.

When the axle comes up from the furnace the mechanism stops until another removal is made.

The axles are quenched in an especially designed machine that grips the axle while hot, then flooded with tempered water.

After quenching, the axles are pickled to remove all scale.

Following pickle the axles are then ready for drawing. The drawing furnace, designed and built by the Surface Combustion Corporation, is located opposite the discharge end of the hardening furnace, adjacent to the quench, for convenience in progressive production.

The drawing furnace has a capacity of 75 tubular axles per hour weighing approximately 17 lbs. each, heated from cold to 800° F., and consists of reheating and soaking zones.

The overall length of furnace chamber is 22 ft. 6 in. with wall to wall width of 71 in., and hearth width of 56 in. It occupies a floor space of 44 ft. long by 8 ft. 6 in. wide. The charge and door is of insulated cast iron. Discharge is facilitated through a slot 56 in. wide by 4 in. high.

The material handling mechanism consists of malleable iron chains supported by cast iron rails, with driving power at the discharge end and sprocket equipment at the inlet end. Variable speed control fixes the charging rate on 18 minute heating cycles.

The furnace is fired with 570 B.T.U. city gas by means of 18 high pressure 2-stage velocity burners.

At a production rate of 75 axles (1200 lbs. net work) per hour gas consumption of the draw furnace is approximately 669 cu. ft. of gas per hour, although burner capacity is 1287 cu. ft. per hour. Automatic heat controls and recording closely regulate heat in both heating and soaking zones.

During the drawing process temperatures are held closely to obtain the desired hardness.

Atmosphere control during heat treating is of such a character that scale is almost entirely absent. Rockwell hardness tests indicate that the heat treating is uniform throughout. Rejections are few.

Safety Contest

ACCIDENT prevention contests, or other means of developing the spirit of friendly competition, are used frequently in industrial safety work to stimulate employee interest.

In small companies, because of the limited number of employees and the relative infrequency of accidents, a contest between the various units of the organization is usually impractical. On some properties, however, an accident score board is erected in each department or unit and the number of days which have elapsed since the occurrence of the last accident to an employee of that particular group is marked on the board in chalk. Interest in producing the largest number of "no accident days" is thus encouraged.

In many instances, excellent results have been obtained by developing contests between a number of small companies in a community, or among those belonging to a particular trade association. Such contests usually prove most successful when the contestants have the same general exposure and hazards, and when a plan is prepared carefully and understood fully in advance. Publicity regarding contests of this nature and the frequent publication of company standings help maintain interest.— *Metropolitan Life Insurance Co.*

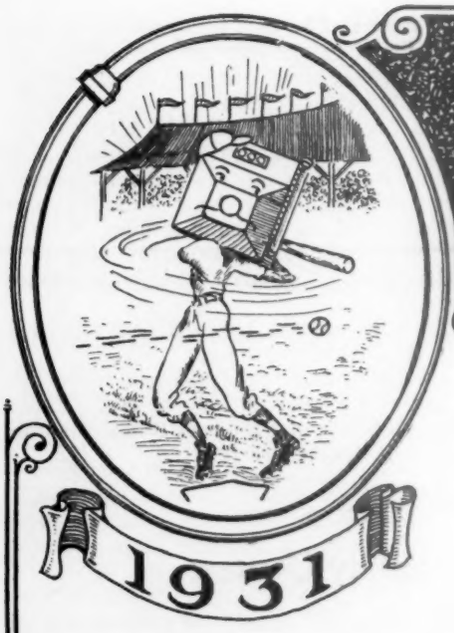
Water Gas Production

(Continued from page 52)

During a period of twelve months, the average coal per M. cu. ft. was 39.8 pounds, making an average cost of 7.9 cents per M. cu. ft.

The oil used is from the California field with a heating value of about 19,400 B.t.u. per pound or 143,598 B.t.u. per gallon, with a weight of about 7.4 pounds per gallon. During a period of twelve months, the average oil per M. cu. ft. was 2.67 gallons, making an average cost of 9.6 cents per M. cu. ft.

While the pounds of coal and gallons of oil may seem high as compared to some plants, the low costs of these materials permit their use, with a joint cost of 17.5 cents per M. cu. ft. The steam consumption for the entire plant could not be measured, but the use of hogged fuel permits the low cost of 1.9 cents per M. cu. ft. for boiler fuel or a total cost of 19.4 cents per M. cu. ft.



AMERICAN GAS MERCHANDISING ALMANACK

October

OCTOBER is the first month of fall when all over this broad land there comes a call for a little heat in the bath, breakfast and living rooms, morning and evening.

October brings better appetites to the ever hungry kiddies returning from school and calls for the production of more bread, cookies and cakes by the home baker.

October 1931 is pretty apt to be full of damp, drizzly days in the southern states, at least up until the 10th of the month, while the central and eastern sections of the country will experience cool, crisp weather. Along about the 12th of the month there is a probability that the weather will clear up and that balmy crisp days will be pretty general until along toward the 26th when an unsettled period will prevail for the balance of the month.

October will be an ideal month in which to sell gas heaters; in fact it may be made a ***banner month*** for the sale of gas heaters if steps are taken immediately to lay the ground work for such an activity.

Window displays and store displays may be worked out to feature the fall colors, from natures paint box; rich yellow-browns, tans, browns and reds. Chrysanthemums are the flowers for October and Opal is the gem.

1—Thur.	Opening of fall "Fill the Fire-place Campaign." Have window displays in place and stock properly priced and displaced on sales floor.
2—Fri.	Run advertisement in Home Maker's or Food Section of Newspaper.
3—Sat.	Check over newspaper advertisement for Sunday newspapers.
4—Sun.	Rutherford B. Hayes, 19th President, born, 1822.
5—Mon.	Send out mailings to prospects stating your salesmen will call next week or at some other time before the first of November.
6—Tues.	Check over advertisement for Wednesday newspapers; go over lists of prospects that have been called on and not sold. try to improve the salesman's approach from the knowledge thus gained.
	Helen Wills Moody, tennis star, born, 1906.
7—Wed.	Re-assemble heater display on sales floor.
	James Whitcomb Riley, poet, born, 1853.
8—Thur.	Go over stocks and re-order needed heaters.
9—Fri.	Run advertisement in newspaper; send mailing to additional list of prospective purchasers.
10—Sat.	Time to think of a change for your store and window displays.
	U. S. Naval Academy opened 1845.
11—Sun.	The first steam ferry used, 1811.
12—Mon.	Columbus Day Landing of Columbus, 1492, may be used to build a window display to tie in to any local celebration.
13—Tues.	Plan to install change in windows, Wednesday or Thursday. Check over newspaper advertising.
14—Wed.	Change window displays and re-arrange floor displays. Time to take down screen doors.
15—Thur.	Send out mailing to new lists of prospects. Check over advertisement for Friday newspapers.
16—Fri.	Talk to salesmen; try to ascertain why prospects called upon do not buy and how they are sold.
17—Sat.	Visit furniture and other stores and see what they are displaying and what folks seem to be buying.
18—Sun.	View your windows today or tonight; see if you can put a new idea into them.
19—Mon.	Activity should be progressing nicely by now. If sales are not being made as anticipated check-over with the idea of improving the entire plan.
20—Tues.	Send mailing to new list of prospects.
21—Wed.	Check-over newspaper advertisements for Friday and Sunday newspapers. Re-arrange floor displays.
22—Thurs.	Only seven full working days before activity ends. Call salesmen's attention to the fact and ask them to use every effort to see and close all live prospects before Hallowe'en.
	Sam Houston elected first president Republic of Texas, 1836.
23—Fri.	Plan to change your window displays on Saturday. Plan your last call advertisements for the coming week.
24—Sat.	Go over all details for next week's drive, make sure that every detail looking to closing the maximum number of sales has been perfected.
25—Sun.	Commander R. E. Byrd, born, 1888.
26—Mon.	Prime the organization to use every reasonable effort to close sales the balance of week.
27—Tues.	Re-arrange store displays using last week display cards.
28—Wed.	Check results with salesmen; use 'phone to try to close some of the doubtful prospects.
	Statue of Liberty unveiled, 1886.
29—Thur.	Check over "last day" advertisement to be run in Friday newspapers.
30—Fri.	Build Special Display for Hallowe'en.
31—Sat.	Sale closes. Line up your forces for November activity.

Space Heaters Are In Season

DESPITE the fact that some gas men are of the opinion that the fall and winter months are going to be rather hard months for business generally, here and there we find others who are going ahead at full steam.

What shall we play-up in October is a question that many gas men have asked during the past few months. The answer is SPACE HEATERS.

October of any year is an ideal time to advertise as well as sell space heaters; to sell them to fill an empty fire place or to provide a hearth for every home. In years gone by the greatest stress was laid on the convenience of quick healthful heat for cool mornings and evenings and for days on which Jack Frost made a sudden unheralded call. Then too, there was the beauty appeal. These appeals are all as usable this fall as ever, yet there are two others that stand out as very timely and which may be used to good advantage. New Low Price and the Saving of Fuel are two appeals that may be employed in connection with sales talks and advertising this fall. Also, where the customer is one who cares nothing about New Low Costs or Fuel Saving, the appeal may be based upon the matter of modern design, new beauty and the ever popular "health ray" appeal.

How to secure a good volume of sales is another matter, and an obvious one as well. It is hinged upon the ancient and honorable idea of exposing the thing you wish to sell to prospective users, and exposing it early and often. Start in early in the month, the first day if you have not already run some advertising, and push your story over; then prime your salesmen with facts about space heaters and keep everlastingly after them to sell space heaters. Make a representative display on the sales floor, set-up all your models and as many of them as you have,—in a measure "pile the floor" with them, let folks who read your advertisements and then come to your store, as well as those who may not have read, see that you mean business, that you really have heaters to sell.

As for a plan in particular there are many that may be used and any of them will produce a very worthwhile heater business and give the old gas meter somewhere between 12,000 and 20,000 cubic feet of gas per year to play with.

A Plan That Always Works

A plan that has always proved productive where carried out to the letter is the Rental Plan. This plan is built around a medium priced heater and includes a low down payment when the heater is delivered and connected, and a low monthly payment each month with the gas account.

In advertising this plan one company used an appeal to fill the old vacant fire place,—"install a modern radiant gas heater, pay 50c down and 50c per month with your gas bill each month, 50c installs a radiant gas heater in your home." In this plan installation was advertised as *free*.

This plan was devised as a load builder. The cost of the heater, plus the salesman's commission of $1.00, plus $3.80, would be returned to the gas company within a period of three years. The cost of sales promotion and advertising was charged to new business.

It is said that where this plan was used the number of rental installations were greatly in the minority and that many of those who entered as rental users paid out in less than one year. All rental heaters were sold on special rental contracts.

The above in a nut shell is the basis of the old rental plan which, with slight consideration to local conditions, will secure business for any gas man who uses it in 1931.

Another idea that has been used to good advantage is one where a drive was made on homes that had empty fire places. The fact that certain customers had such fire places was ascertained by meter readers. Meter readers were given a questionnaire which he had the customer answer and for which he was paid a nominal sum for each one turned in. This questionnaire asked only two or three questions; one in regard to service, one about the condition of appliances, the other regarding the number of rooms, and in addition, the questions: "Do you have a fire-place in your home? Do you use it in winter?"

Let Us Demonstrate This Source of Health and Happiness

***The* HUMPHREY Radiantfire**

---on a Trial Rental Plan

WHY NOT warm up with instant heat during the chilly days—with cheerful, sunny, Radiant warmth that glows from your fireplace and brings health to your whole family.

These advantages are all yours and here is the plan:

Use a Radiantfire in your fireplace on our Trial Rental Plan and form your own opinion as to its merits. You only pay $5 as rental for the Radiantfire installed and can use it for a full year if you wish. After you've tried it and should not desire it, we'll take it away. You're the judge But at anytime, when you decide it does all the things we claim for it, you can purchase that Radiantfire or any other model Radiantfire, and the $5 rental applies toward the purchase price.

Over a million Radiantfires now in the homes of satisfied users testify to this modern way of using fireplaces. Join this great family---and make these same benefits yours.

---and here is what you enjoy:

Adds a touch of beauty to the room---makes the fireplace GLOW with its flickering flames.

Clean heat---no mess, no smoke, no dust---means easier housework.

Healthful---all products of combustion go up the chimney.

Always ready---no matter what the weather is, you can be comfortable.

Instant heat---from your fireplace.

Easily controlled---a twist of the wrist and your heating work is done.

Pays for itself through fuel savings alone. You can shut down the furnace weeks earlier in the Spring and start it later in the Fall.

Just telephone our office and a Representative will call on you. Davenport 1234, local 390.

PACIFIC GAS AND ELECTRIC COMPANY

P·G·and·E·

Here is how the Pacific Gas & Electric Co. advertised a Rental Plan. This folder was printed in red and black. On the front, address side, was printed "Something new from the P. G. & E."

When this information came in from day to day it was turned over to the sales department who followed-up by personal calls and told the story of the convenience and economy of radiant gas heaters.

In selling radiant heaters it is our opinion that the management should get squarely behind a planned activity to sell this appliance in volume. This plan should include a fixed policy as to prices and terms. If a drive is to be staged for October and a special price or special terms are to be offered, make it quite clear to all alike, salesmen and customer, that the Special is *Special* in the full sense of the word, and if prices are to go back on November first, put them back.

The matter of commissions and bonuses should be worked out, if the drive is to be worked as planned and any reasonable bogie is set up. Turn-over should warrant an extra commission or a payment to employees for leads turned in that develop into sales.

During such a drive make your store and windows look like you have heaters to sell. In designing your window display advertising, plan it to show uses—not just decorations. Make it symbolic of the season if you will, but do not clutter it up. If you have a display man say to him that you want a window that gets over the story of thrift, sun-rays, vigor, radiance, health, comfort—he'll get the idea.

In writing your newspaper advertisements, direct mail material and letters play up these themes and weave the New Low Price and saving of fuel ideas into the body of your advertising. If you use a rental plan, play up the low rental, if a Free Trial Plan, play-up "try it at our expense" and wind up with the statement, "you are in no way obligated if it is not all that we represent." "Your money will be cheerfully refunded if you are not entirely satisfied," is another statement that may be profitably incorporated in your advertising.

The old idea of a heater connected just inside the store door is one that may well be used from now until the opening of your February Clearance Sale. A sudden breath of warmth is mighty welcome to any one on a cool crisp October morning and will cause folks to pause. If you use the connected heater in your store, see that there is an appropriate card explaining your plan alongside the heater and that folders showing the complete line with prices and terms are close at hand.

Where the gas man is co-operating with heating contractors and other dealers, complete details of the plan should be gone over with them and arrangements made for suitable stocks for their stores as well as suitable window displays. Any manufacturer of radiant gas heaters will gladly co-operate with you if you decide that this business is worth going after. Write them for plans and samples of helps that they are able to supply you.

Canning and Baking Contest

SPECIAL CORRESPONDENT

FOCUSING attention on their Home Service Department the Laclede Gas Light Co., St. Louis, Mo., last summer held a very interesting canning and baking contest, which was widely advertised. The first prize in each contest was a modern gas range valued at $175; while the two second prizes were other ranges valued at $80.

A whole battery of windows in their main salesroom were given over to displays featuring the contest and modern equipment with which to prepare the pastry and the canned goods. One window showed the four stoves to be given; while others featured pressure cookers, refrigerators, hot water heaters, and gas ranges. The refrigerator window was especially catchy. Green silk curtains were looped back to show the life size sketch of a chef, while at each side were refrigerators. Mindful of the fact that many are not yet ready to install an iceless refrigerator, they showed a substantial, well insulated standard type. The card, however, after describing its good points, went on to say "This extra insulation makes refrigerator suitable for mechanical refrigeration."

Large cards in the window gave the rules of the contest, and these were also printed in a number of the ads—which showed cuts of the ranges to be given as prizes:

RULES

Contests are open to St. Louis women only.

Only one entry accepted for each contest, but anyone can enter both contests.

No entries for Canning Contest accepted before August 6th, or after August 10th.

No entries for Baking Contest accepted before August 13th, or after August 17th.

Entry for Canning Contest: One pint jar of fruit or vegetables.

Entry for Baking Contest: Pies, cakes, cookies, or anything that comes under the head of baked goods.

Positively no material, jars or dishes returned.

Bring your entry to the Laclede Gas Building, or to any of the three local branches.

On the date of the awards public presentation of the ranges was made.

Direct mail was also used in putting over the city-wide contest. To all patrons a little card was sent, inserted in the envelope for the gas bill for July. This peppy little card suggested:

WIN A NEW GAS RANGE

Prizes to be Given in a Baking and Canning Contest

These prizes are worth working for. High quality, modern gas ranges (two in each contest). Surely you've had more than ordinary success with some certain cake or other baked goods; and you've put up preserves or canned fruit that has been complimented by your friends. Turn this skill and ability to advantage and enter the contests. Your chance is as good as that of anyone.

This contest gave wide publicity to gas appliances for the home.

Using Customers To Close Sales

CHAS. N. TUNNELL

ALTHOUGH it yet seems to be a favorite form of advertising with the cigarette manufacturers, many national advertisers and many consumers are questioning the weight of testimonial advertising; that is, where these testimonials come from national people of importance that are ready and willing to indorse every thing from golf balls to automobiles, the kind of dentrifice they use and name of their favorite hosiery.

But there is one form of testimonial advertising that the gas appliance merchant can hardly afford to overlook. This advertising is a mere matter of using the present users of appliances to sell more prospects—and these testimonials need not come from national figures and they need not cost a cent for the endorsement. The endorsement of the average Mrs. Housewife concerning her new gas range, her gas-fired refrigerator or other appliance has more weight than what a favorite movie actress may have to say on the subject. The average prospect knows that movie stars can afford any luxury, these prospects may be interested in a home luxury, but it must also stand the test of economy, practical in operation, an added fixture of beauty for the home and other merits.

There is one manager of a commercial department for a Southern gas company that has capitalized on his customers by devising ways of using them to sell other customers. One such method this man has used is that of preparing an illustrated booklet compiled from actual local examples. This dealer has had fine results with colored gas ranges and especially with those with a colored trim. He has used the theme of color harmony in the kitchen to a fine advantage.

Photographs Help

When outstanding sales have been made, he has had a commercial photograph made of the customer's kitchen after the installation. These photographs are tinted by the photographer to correspond with the colors of the appliances and the interior colors of the kitchen.

These photographs have been made to show one or more examples of every color combination of a gas appliance sold by this concern. These tinted pictures are pasted on the pages of a large looseleaf type book that is kept out in the sales room. For instance, one picture may show a section of a kitchen finished in a shade of green, the kitchen equipment will include a gas range in green or white with green trim; other kitchen and home appliances are in harmony. Along with the pictures, the name and address of the owner of the home in question is written beneath the picture. At times, a snapshot of the exterior of the home is likewise mounted on the page, while if there has been a letter from this customer setting out her appreciation for service and performance of the appliance, the letter is pasted to the opposite page to give a complete history of the sale that pleased the customer.

This sales manager informs, "There are plenty of pictures of attractive kitchens displaying gas appliances that we could obtain from manufacturers and from national magazines, but when we have an actual photograph of a local home, carrying the name and personal recommendation of a local woman, prospects are all interest. They realize that if Mrs. Jones of her city can have a cool, comfortable and convenient kitchen, they, too, can have modern gas appliances to help increase the beauty and convenience of their own homes. We use this book with doubtful prospects, and we find it especially good to sell a complete idea of remodeling and refurnishing the home with modern appliances. Turning through the book with the prospect helps us to find the color scheme she likes; it helps her to volunteer suggestions of her own home and own appliances; and this book helps us to center her attention on the idea of beautifying her home instead of buying a mere article for utility."

Another method that this firm uses to a good advantage in using the present customers is that of publishing a newspaper within a newspaper. Every two weeks, this firm runs a quarter page newspaper advertisement. Frequently, these are devoted entirely to the commercial sales. From time to time, this entire space is filled to represent a page from a miniature newspaper. News items concerning different gas appliances are given, while frequently there will be a list of the newest customers buying new gas-fired refrigerators, incinerators, laundry dryers or similar equipment. Little news notes regarding school activities, parent-teachers association activities, etc., are given where it has a tie-up with food for school children or similar subjects. And at other times, favorite recipes from local users of a particular type of gas range and other items are published. Each such news item published in this advertising section is done so with the consent of the person whose name is used.

Value of Figures

Every woman rather well knows about the gas consumption of a gas range or of a radiant heater, but many do not know about the gas consumption of a gas-fired refrigerator, laundry equipment, incinerator, etc., or of certain types of gas-fired heating systems. This commercial manager has found sales are easier to the skeptical by showing them some facts and figures compiled from the regular monthly accounts of customers. Customers are taken in all sections of the city as representative ones or selected because they operate certain types of gas appliances. These accounts are checked back and the gas bills listed over a period of months before certain appliances were added; then the gas consumption is shown for corresponding months after the additional appliances have been installed.

This commercial manager declares, "A lot of prospects have heard about the expense of certain other types of mechanical refrigerators, they cannot conceive of the fact that a few cents more a month is all that it will cost to operate a gas-fired refrigeration unit. The same applies to several other appliances. We could quote them figures . . . and they would believe us to a certain extent. But when we thumb through a small book where we have listed for handy reference and show where certain local women are using the mentioned appliances and show them a comparison of service charges before and after, the most skeptical of prospects are convinced of the economy of gas appliances . . . and the local tie-up arouses a certain amount of pride. Prospects reason that others of the city are having these conveniences and that they may as well keep in step."

One method that is used by salesmen of this commer-

cial department more or less frequently is that of having one user of an appliance write a personal letter to a prospect for this type appliance. Of course, this is a service that must be obtained with good business judgement and cannot be carried too far; but it is especially successful in selling heating systems for commercial houses, new type heaters, etc., and it has likewise worked successfully in a number of instances with home appliances. Prospects that are undecided as to whether they will buy a gas appliance or use some other type of heating or cooking unit are merely informed by the salesman that he wants them to inquire and ask users of his type of appliances. And as further suggestion, he informs the prospect that he is going to ask one or two users of the appliance he is trying to sell to write the prospect their experiences, good and bad, with the appliance and without any censorship from the salesman.

A number of pleased customers have actually written several letters when invited to by the salesman that sold them the appliance, and after he explained that he merely wanted the truth of the appliance's performance.

A Productive Plan

But probably the most productive method that this sales manager has of using his users is that of requiring his salesmen to call back from a week to two weeks after a major appliance has been installed. These call-back visits are short, a mere inquiry if everything is satisfactory. In most instances, the customers volunteer some good leads to similar sales to friends and associates . . . if these leads are not volunteered, a query often produces the leads. And in not a few instances, these salesmen have found the purchaser of a hot water heater ready to talk about the replacement of her gas range with a new and more efficient model after being pleased with her first purchase or similar instances where one sale is just the introduction that leads to others.

These salesmen are quicker to realize the importance of recontacting a customer soon after a sale since this sales manager has posted up a bulletin board in the assembly room for salesmen. This board is checker-boarded with spaces for each day of the week opposite the name of each salesman on the payroll. Each day, the amount sold by each salesman is recorded in this space for the particular day, enabling each man to see what all are doing.

But in addition to the names of the salesmen listed, "Telephone" is listed as a salesman; "Newspaper Ads" is listed; "Store Sales" is listed and so is "Customer." A salesman gets credit for any sale that he makes and he gets credit for sales that are made to prospects he has recently indexed or is yet trying to close. But if an unlisted or unindexed prospect telephones for a certain appliance as a result of seeing the telephone card in the directory or merely the name of the distributing company, this sale is credited to "Telephone." And if a prospect comes in unsolicited and buys an appliance, explaining that some user of the appliance sent her to buy a similar one, the sale is credited to "Customer." No commission is paid to this friend and customer making the recommendation, but her name is obtained and she is telephoned and thanked for her cooperation or a personal letter reaches her for the same purpose.

But the fact that frequent sales are credited up on the bulletin board to "Customer" has a psychological effect. Salesman can see for themselves that it is important to follow-up and to keep in contact with the users.

Gas Industry Should Stress Quality Appliances

WILLIS PARKER

"IN the merchandising of gas appliances, we bend our energies toward the sale of quality goods,—fully automatic appliances," says Clyde H. Potter, Commercial Manager of the Southern Counties Gas Company, California. In his opinion the use of such equipment in the homes is certain to retain the housewives as customers, keep them satisfied with the service and make them greater users of the fuel.

The discussion was anent criticism directed against gas companies by some retail merchants who charge that the gas companies should concern themselves solely with the production and distribution of gas and stay out of the merchandising field altogether. Mr. Potter brings up some very valid points in favor of the merchandising department and explains some of the objects his department seeks to accomplish.

The utilities must aggressively sell their merchandise, he says, to be certain that the gas users will be completely satisfied with the service. The average retail merchant is interested not so much in the quality of the appliance he sells as he is in making a sale; and, rather than lose a sale, he'll give the customer what she wants and not what she should have. It is to the interest of the gas industry to see to it that the users purchase what they should have in order to gain the maximum satisfaction from the use of gas. In almost all instances this is quality appliances.

The use of quality appliances has a distinct bearing upon service, for it is certain that, unless the appliance functions satisfactorily at all times, the owner is likely to become dissatisfied with the gas and not with the appliance. The low price he paid for the appliance will be forgotten. And, since the gas company is usually called upon to service any appliance, regardless of who sold it, it is apparent that the higher quality of the appliance will reduce the number of service calls.

The gas industry has been criticised somewhat because of liberal trade-in allowances made and the long terms of payment granted. The quality angle again is the answer. The chain stores, recognized as among the most aggressive and up-to-date merchandisers, make trade-in allowances and sell on the deferred payment plan. But such organizations are not particularly interested in the quality of the appliances; they are interested in a volume of sales. Hence the gas industries must grant terms and must give trade-in allowances in order to increase the number of quality appliances that go into the home.

Trade-in allowances and deferred payment selling are modern merchandising principles. Hence the gas appliance merchandiser must follow suit; the public expects it. This firm offers a flat 10 per cent trade-in allowance, though it must be admitted that some of the stuff taken in isn't worth the money. But there is a

(Continued on page 67)

THE OUTSTANDING DEVELOPMENT IN CARBURETTED WATER GAS MANUFACTURE

* * *

THE U.G.I. HEAVY OIL PROCESS

(Patented)

As successfully used at Philadelphia, Newark, Atlantic City, Norwalk and New Haven, Conn., Tampa, Fla., and Long Branch, N.J.

* * *

We shall be glad to discuss the savings which the U. G. I. Heavy Oil Process makes possible in your plant.

THE U. G. I. CONTRACTING COMPANY

DIVISION OF

UNITED ENGINEERS & CONSTRUCTORS

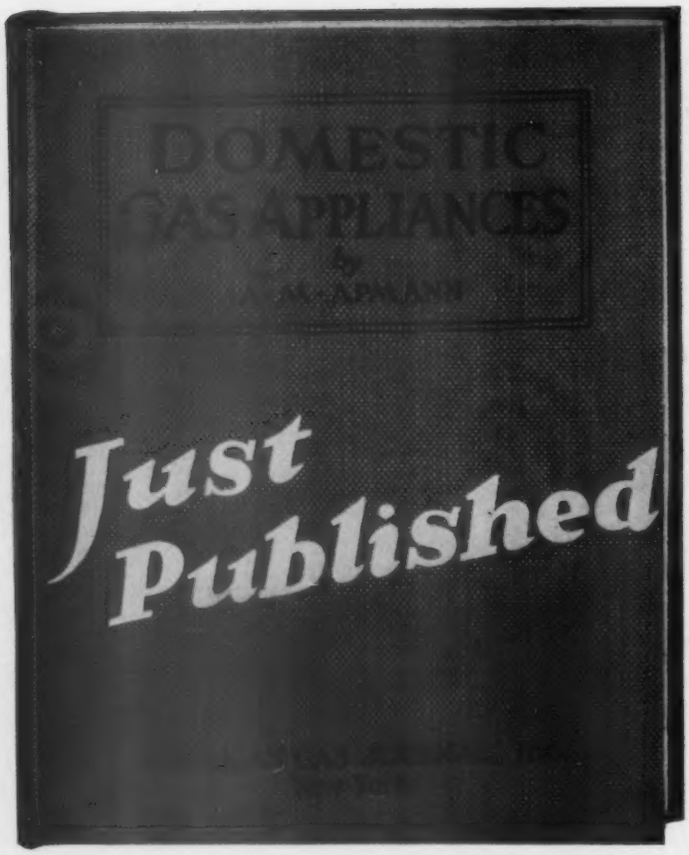
INCORPORATED

DWIGHT P. ROBINSON, PRESIDENT

Philadelphia
112 North Broad Street

Chicago
Conway Building

MAXIMUM RETURN TO CLIENTS PER DOLLAR INVESTED



A TRIBUTE FROM ABROAD

In reviewing "Domestic Gas Appliances" in the July, 1931 issue *"The Gas Salesman"* of London, England, comments as follows:

"For some time Mr. A. M. Apmann has been contributing to the 'American Gas Journal' a series of articles on 'Gas Utilization Technology for the Domestic Salesman.' These articles have been revised, and have been printed in book form. The result is a compact volume which is sure to be of great help to the gas salesman in the United States, and which should appeal to, and assist, those engaged in similar work in this country. Throughout the book the text is direct and most readable, the illustrations are for the most part well chosen, and many of the graphs show that the author has broken away from the unworthy tradition of most text-books of this nature . . . .

"To sum up, then, 'Domestic Gas Appliances' is a book the study of which cannot but benefit the gas salesman, whether his country be America or Great Britain; and although we feel that the salesman in the States will derive the greatest and most immediate value from the book, there is no doubt at all that it would prove most interesting to British gas salesmen. Certainly it is calculated to broaden their vision and eliminate confusion; and there is everything to be said for gaining an understanding of the problems of the Gas Industry in America and the methods employed in their solution. To the English gas salesman the book may give many valuable ideas."

AMERICAN GAS JOURNAL,
53 Park Place, N. Y.

Please send me one copy of "Domestic Gas Appliances," by A. M. Apmann, at $2.50.

NAME .....

POSITION .....

ADDRESS .....

HAVE YOU RECEIVED
YOUR COPY OF THIS BOOK?

AMERICAN GAS JOURNAL

53 Park Place, New York

GO WHERE THEY ARE

» » AND SEE THEM PERFORM

TYPE-2

This Latex station of United Gas Company started with five; now they have eight Cooper-Bessemer twin units of 1000 B. H. P. each.

WHEN big engine-compressors are to be bought, there's nothing so convincing as a personal inspection of one or more Cooper-Bessemer powered stations. Probably, you won't have to travel very far — due to the great preponderance of Type-22 installations along the main natural gas lines. See these compressors; read their records; question the station men. Then your decision is easy. Write for a list of standard 1000 B. H. P. installations near you.

THE COOPER-BESSEMER CORPORATION

MOUNT VERNON, OHIO — GROVE CITY, PENNSYLVANIA

201 E. 1st Street, Tulsa, Oklahoma — 1313 Magnolia Building, Dallas, Texas — 640 E. 61st Street, Los Angeles, California — Suite No. 301, 25 W. 43rd Street, New York, N. Y.

BRANCH OFFICES IN ALL PRINCIPAL OIL FIELDS

COOPER-BESSEMER

For the construction of Distribution Systems for

BUTANE AND PROPANE PLANTS

We specialize in the design and construction of complete distribution systems.

Bring us your Butane and Propane distribution problems.

THE U. G. I. CONTRACTING COMPANY
DIVISION OF
UNITED ENGINEERS & CONSTRUCTORS
INCORPORATED
DWIGHT P. ROBINSON, PRESIDENT

Philadelphia
112 North Broad Street

Chicago
Conway Building

MAXIMUM RETURN TO CLIENTS PER DOLLAR INVESTED

Stress Quality Appliances

(Continued from page 62)

psychological element to consider, according to Mr. Potter. Consider the case of an automobile owner. He paid a definite sum for his car. It gave him considerable enjoyment—will give him more if he holds onto it, and therefore he feels it is worth more than a mere fraction of what he paid for it. If you tell him it is worth nothing, he's insulted. The same holds true with the owner of a radio set or a gas range. In the case of the latter, the housewife recollects the number of meals she has cooked on it. She could cook many more, and, since it's still in the running and capable of offering a degree of satisfaction, you insult her if you declare it is worth nothing.

It is apparent that this psychological condition must be met and it cannot be satisfactorily met, as far as the owner is concerned, except by a fairly liberal allowance. And, as long as allowances must be made, it is far better to make them in connection with the purchase of a quality piece of goods, for it is also certain that even if the customer does not obtain as much for the old as she anticipated, or thought it was worth, the greatly increased enjoyment obtained from the use of the new, quality appliance, will gradually prove to her that there was a wide spread in efficiency between the old and the new. She can more readily understand why her old appliance was worth no more.

"When we aggressively advertise quality gas appliances," says Mr. Potter, "the other dealers in the community feel its beneficient effects and sell more and better appliances. We plow up a lot of ground and uncover a lot of worms which the dealer-birds may pick up while we're picking up a few of our own. Many dealers have freely admitted this to us."

Think Now About Next Winter's Blizzards

W. B. STODDARD

Gas, the best heat medium, is adaptable to many heating appliances for the home, giving dependable and silent service, with sensible economy.

EVERY winter an army of disgusted men cover themselves with soot and ashes stoking the furnace; each winter regiments of housewives complain of the dirt and smoke caused by the old coal and wood burning furnaces.

The Laclede Gas Light Co., St. Louis, Mo., last fall conducted an interesting and very effective campaign along this line. They started out with a big ad, adorned with cuts of a gas fired furnace, boiler, steam radiator, radiant heater, garage heater, and combination gas range and kitchen heater. Each of these was enticingly described, such as:

> Springtime warmth all winter is open to your home. Balmy, luxurious warmth, automatically regulated to a degree and no noise with
>
> A GAS-FIRED FURNACE

The ad was captioned:

> THINK NOW ABOUT NEXT WINTER'S BLIZZARDS
>
> It is the custom of many St. Louis householders to start laying in next winter's fuel during the summer. A praiseworthy act of sound domestic economics. BUT ... supposing it were not necessary to tie up any funds in fuel for future use? What a boon to the bank balance.
>
> Users of Gas for Heating pay for the fuel after they use it each month. They never have any money tied up in fuel. This feature of gas, coupled with its economy, cleanliness, dependability, and controllability, make it the fuel for the progressive man who applies the same principles to living that he applies to his business.

They backed this up with a big corner window showing a couple of modern gas fired furnaces, and between them in a huge frame, life size cutouts of a king on his throne, with two pages bowing before him. Overhead was emblazoned on a scroll "A King Can Have No Better Heating Service." Down front, hung with silken drapes was a card:

> A KING CAN HAVE NO BETTER HEATING SERVICE
>
> Heat your home with gas; break away from old fashioned heating fuel, with its dirt, waste and work. Gas heat is automatic, clean, dependable. A safety pilot light control is part of our standard equipment on all central heating plants.

After the initial ad a number of others were run, calling attention to the low gas rates, and featuring a moderate priced house heating unit. Most of the ads carried coupons, and many of these were mailed back to the Gas Co. asking for more information.

In response to these inquiries, and as a follow up of their newspaper and window display publicity, the company issued a four page folder. This was done in four colors, in a size 8½ x 11 inches. It was folded in the centre, so that when the recipient opened the envelope he was greeted with the sight of orange and red flames shooting up through a modernistic background, upon

which was lettered "Ask Yourself This Question." Naturally the reader would open the folder to learn what question he was to answer. At the top of the second page, set in the centre of the page, appeared:

WHAT WILL IT COST TO HEAT MY HOME WITH GAS?

Perhaps you have never considered the luxury of gas heat. Many people have pictured it as too expensive a luxury. However, the adoption of a gas heating unit that can be installed for approximately half the cost of any other type of good automatic heat has brought gas house heating within reach of the average home in St. Louis.

The new gas heating unit can be installed in the average furnace or boiler, whether hot water or warm air, for $250, complete.

On the third page was a picture of a family in a comfortable living room, while in the corner was a section of a basement with a gas furnace. On the back page were photos of five St. Louis homes that have enjoyed gas heating for several years. Each was in a different section of the city, so no matter to whom the folder was sent, there would always be some home in his section. Four letters from satisfied users of gas heating units were also printed on the rear page. A carefully prepared list of prospects was prepared, and folders were mailed to them at the rate of 50 a day, this being done to allow salesmen in the house heating department time to follow up with a personal call soon after the prospect received his letter.

Effective Househeating Display

THE Gas Househeating display pictured herewith, was designed and executed by the Public Service General Display Department Studio at 29 East Park Street, Newark, N. J.

They are a part of a regular scheduled display service prepared and included in a budgeted expenditure each year for New Business Merchandising activities of Public Service.

Such displays are produced at an average cost of $30.00 per display. They are made in duplicate, to enable the department to cover its entire territory, consisting of 25 district offices throughout the State of New Jersey. They are shown for one week periods in each district office.

This company endeavors to keep Househeating by Gas, constantly in the public eye and we find that a display of this important gas load builder, every other month throughout the year, produces the desired results.

Limits of Inflammability of Gases and Vapors

THE publication of a revised and enlarged edition of Bulletin 279, "Limits of Inflammability of Gases and Vapors," by H. F. Coward and G. W. Jones, is announced by the United States Bureau of Mines, Department of Commerce.

A knowledge of the limits of inflammability of methane, and indeed of the products of distillation of coal, in air and in partly vitiated atmosphere, is of fundamental importance in the study of mine explosions and their prevention. Likewise, a knowledge of the inflammable limits of gasoline and benzol vapors, natural and manufactured gas, blast-furnace gas, hydrogen, acetylene, and many other gases is of equal importance in the prevention of gas explosions and fires in the metallurgical, petroleum, gas-manufacturing, and related industries.

The importance of such data is shown by the increasingly frequent inquiries received at the Bureau of Mines for information on the limits of inflammability of various gases and vapors when mixed with air or other "atmosphere."

Substances that a short time ago were found infrequently, even in the laboratory, are being used on a large scale, and some of them form dangerously explosive mixtures with air. Data concerning their limits of inflammability are widely scattered in the literature, and many of the figures seem contradictory. In Bulletin 279, a comprehensive survey has been made which, it is hoped, includes all available results; the latter have been arranged, coordinated, and critically reviewed. The opportunity has been taken to include a number of results that have not hitherto been published.

Copies of Bureau of Mines Bulletin 279 may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at a price of 20 cents.

Jas. L. Stone
President Elecet, Pacific Coast Assn.

Pacific Coast Gas Association Holds Epoch Making Convention

SPECIAL CORRESPONDENT

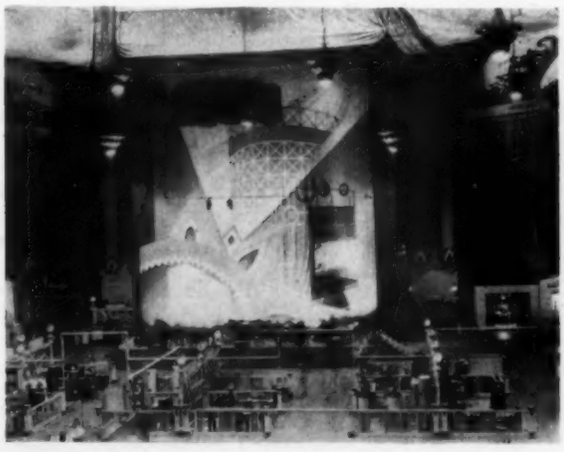
THE Thirty Eighth Annual Convention of the Pacific Coast Gas Association and the first natural gas exposition to be held on the Pacific Coast, was formally dedicated on August 31, by Mayor Angelo J. Rossi, at a luncheon held at the civic Auditorium. The luncheon was given by the Pacific Coast Gas Association in honor of the exhibitors in the Natural Gas Exposition.

Mr. Paul M. Downing, Vice President and General Manager of the Pacific Gas & Electric Company, acted as Chairman. Mr. A. F. Hockenbeamer, President of the Pacific Gas and Electric Company, made the opening address, pointing out that the luncheon was being held on the seventy-ninth anniversary of the incorporation of the first gas company on the Pacific Coast, and the twenty-fifth anniversary of the Pacific Coast Gas Association Convention in San Francisco in 1906, which was the first convention of any organization to be held in San Francisco after the fire. Mr. Hockenbeamer pointed out the wonderful progress made by San Francisco since that convention and described the part taken in this progress by the gas company.

Mr. Hockenbeamer was followed by Mr. R. E. Fisher, (retiring president of the Pacific Coast Gas Association,) who gave a brief account of the bringing of natural gas to the Bay region, and told of the part being played by this fuel in the industrial growth of Northern California Cities.

Mr. C. B. Babcock, President of the C. B. Babcock Company, San Francisco, made a brief talk on behalf of the exhibitors in which he called attention to the vast improvements made during recent years in the design and construction of gas appliances, particularly in regard to complete automatic controls now available on appliances for any type of service.

Mayor Rossi expressed his appreciation of the influence natural gas would have on the future industrial



Section of Exposition Hall. Left—Showing overhead pipe carrying gas to booths. Right—Showing scenic effect on curtain

growth of San Francisco, and upon the completion of his talk he pressed a button which ignited a huge natural gas flambeau on the stage, officially opening the Natural Gas Exposition.

The luncheon was followed by a preview of the Exposition for the delegates of the Pacific Coast Gas Association Convention. The exhibition was open to the public at seven o'clock Monday evening August 31 and was open daily during the week from 1:30 to 10:00 P. M. Approximately half a million admittance tickets were distributed.

A thirty piece orchestra played each evening, and special vocal selections were rendered by a sextette.

Election of Officers

The first business meeting of the Convention was held Tuesday morning September 1, at which Mr. Jas. L. Stone, Vice President and General Manager of the Spokane Gas and Fuel Company, Spokane Washington, was elected President of the organization, succeeding Mr. R. E. Fisher of the Pacific Gas & Electric Company. Mr. Harry L. Masser, Vice President and Executive Engineer of the Los Angeles Gas & Electric Corporation of Los Angeles, was elected Vice President, and Messrs. W. C. Hornberger, of Phoenix, Arizona, F. M. Banks of Los Angeles, A. E. Hollaway, of San Diego and J. B. Wilson of Santa Cruz, were elected to the Directorate. Mr. D. G. Martin, of San Francisco, was re-elected to the post of Treasurer.

In his opening address, President R. E. Fisher stated that the depressed condition of business served to emphasize the stability of the nation's public utilities and the soundness of private ownership of utilites supervised by public regulation. He pictured the public utility, owned by thousands of stock holders, managed by experts and controlled in its every action by public authority, as being the type of economic unit which, if extended to other types of business, would do much to cure the economic muddle of our business depressions. He told the association that in spite of the business depression, gas sales on the Pacific Coast have increased by nearly 2% in 1931 over 1930 and the number of customers have increased over 2%. The decrease of 4% in revenue was ascribed partly to the depression but more largely to the radical rate reductions resulting from the substitution of natural for manufactured gas in Northern California.

Edwards Talks On Merchandise

Mr. Leroy M. Edwards, General Counsel for the Southern Counties Gas Company, Los Angeles, addressed the Association on the subject of "Utility Merchandising." Mr. Edwards pointed out the benefit accruing to retail dealers in gas appliances due to active sales promotion and advertising by the gas companies, and cited many instances of increased business to groups of dealers resulting from merchandising activities on the part of utilities. Gas Companies' efforts also result, according to Mr. Edwards, in better value in appliances and better type of installation to customers.

"The Greatest Asset of a Public Utility" was the subject of an address by Dr. H. R. Halsey, of J. David Houser and Associates, New York City. Dr. Halsey pointed out that above all else, a public utility must have a well trained and efficient organization, for a public utility is selling service and the character of this service depends upon the proper functioning of its employees. He recommended intensive training courses for all employees, especially those whose duties require them to contact the public.

Miss Jessie McQueen, Home Service Counsellor, American Gas Association, in her paper, "Home Service—Its Activities and Results," gave an illuminating version of the value of Home Service and the fine results it is accomplishing. Touching upon the expense involved in operating a Home Service Department she said:

"The costs of a Home Service Department vary just as much as the advertising in any utility budget. Many companies allocate the cost of this department to different divisions of the companies' activities—some of it may go to advertising—some to new business—some to the operating department.

"In estimating the cost—shall it be per meter; shall it be per person contacted, or shall it be per person possible to contact.

"Two large eastern companies report:—one reaching 500,000 meters budget $50,000 to Home Service; another with 800,000 meters allows $57,000. This latter includes the salaries of fourteen women, amounts paid to nine demonstrators, maid service, stationery, printing, transportation and costs of card parties.

"A smaller company with 25,000 meters has an expense for Home Service of $6,734. Another company with 80,000 meters and embracing an area of 8,000 square miles, operating in eleven counties—budgets to Home Service $18,000. One Company with a very successful Home Service Department reports a cost of one cent a meter per month. *Your* cost will depend upon *your* version of its usefulness."

Fine Display of Appliances and Equipment

The Natural Gas Exposition held in conjunction with the convention of the Pacific Coast Gas Association occupied the main hall of the Civic Center Auditorium and was the largest and most extensive display of gas appliances ever made in San Francisco. The Exposition was sponsored by the Pacific Gas & Electric Company as a means of enabling the public to visualize what gas service could mean when modern appliances are used. In sponsoring the Natural Gas Exposition the company afforded to manufacturers an opportunity to bring before the people the very latest in gas appliances and equipment. The Company shouldered the major portion of the burden of expense, the charges to exhibitors for space having been the lowest ever charged in San Francisco Civic Auditorium for a show of this magnitude. (It is believed that approximately 200,000 people visited the Exposition which was opened to the public at 7:00 P. M. Monday August 31 and open daily thereafter from 1:30 P. M. to 10:00 P. M.)

While the Exposition was intended primarily as a demonstration of gas and gas equipment to the public, it nevertheless afforded an excellent opportunity for manufacturers of production, accounting and distribution equipment to demonstrate their newest devices and materials. A limited amount of space was made available for this purpose.

Gas was piped throughout the auditorium for use in the appliances. In order to safeguard the ventilation of the exhibition hall, exhibitors were restricted to one ¾ inch outlet for each booth.

The Pacific Coast Gas Association has always maintained a high record as regards the excellency of its Committee Reports and in this connection the present meeting was productive of material which will compare very favorably with any similar efforts, regardless of their source. Several of these reports in part follow.

Report of Sub-Committee on Governor and Regulator Capacities

Automatic Pressure Boosters on Gas Governors

THE simplest method of pressure boosting is to extend the static or breather line to a point where the gas flow branches out into various feeders, in this way overcoming the large friction loss through the outlet line of the governor and maintaining a constant pressure at the point where the extended static line ties into the main. The operation of this method needs no explaining. This method is not altogether practical, however, for it is necessary to run too long a line, there is a certain risk of the line being trapped or broken and the governor valves falling wide open, thereby putting the high pressure gas into the system.

Another method is to insert a restriction in the outlet of the governor and connect the static line to the point of the restriction. As the flow of gas increases at peak hours, the velocity through the restriction increases, thereby increasing the vacuum tendency on the static line which, in turn, lowers the pressure under the diaphragm, making the weights more effective and thus increasing the delivery pressure. With this type of booster, critical flow formula must be observed; for it may be seen readily that if the restriction is too great (too small an orifice), it is quite possible that sufficient gas cannot be passed to supply the gas consumption. Where the consumption is known accurately, the necessary restriction may be calculated, but where the consumption is unknown, the restriction must be determined experimentally, and the orifice selected should be the largest one which will give the desired compounding.

Another type of compounding would be with pilot control using the solenoid valve and a time clock, but this method would be practical only when the peak hour occurs between the same hours of each day as the operation of it would not depend on the gas consumption.

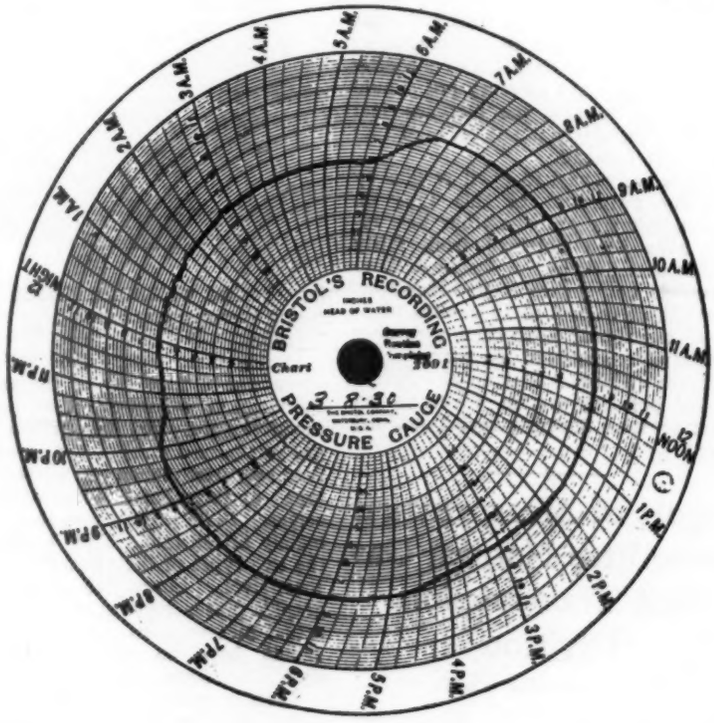


Figure 2

Figure 1 shows a method of automatic boosting as designed by Mr. Goldkamp, of the San Diego Consolidated Gas & Electric Company. Quoting from Mr. Goldkamp, a description of it and its operation is given:

"Raising or compounding the pressure is accomplished automatically by use of the impact pressure which is inherent in all balanced valve governors during flow periods. This impact pressure is the result of the force of the high pressure gas passing through the lower valve orifice into the low pressure chamber of the governor. Since this impact pressure has a wide range and varies with the output of the governor, we utilize it for the purpose of loading and unloading the governor main diaphragm with mercury.

"The means by which we isolate this impact pressure is described as 'Impact Pressure Head.' This impact pressure is transmitted by a ⅜" pipe into a drip pot where all free oil and water are separated from the gas; then into containers filled with cotton and silica-gel for the purpose of lowering the oil and water vapor content of the gas to insure stability of the needle valve adjustment. From the needle valve we run a ¼" pipe and hose into the top of the 'Primary Mercury Pot,' which is inserted into the 'Primary Mercury Pot Housing.' This housing is permanently attached to the flange of the governor diaphragm bowl and provided with an 'Adjustment Stem and Wheel' for lowering or elevating the 'Primary Mercury Pot.' From the 'Primary Mercury Pot' the mercury is forced through the hoseline into the 'Secondary Mercury Pot' which operates inside the 'Secondary Mercury Pot Housing' and is centered in the housing by eight small steel guide wheels.

"We place about 42 pounds of mercury in the primary mercury pot, and remove both wooden and cast iron sleeve bushings from both this pot and the

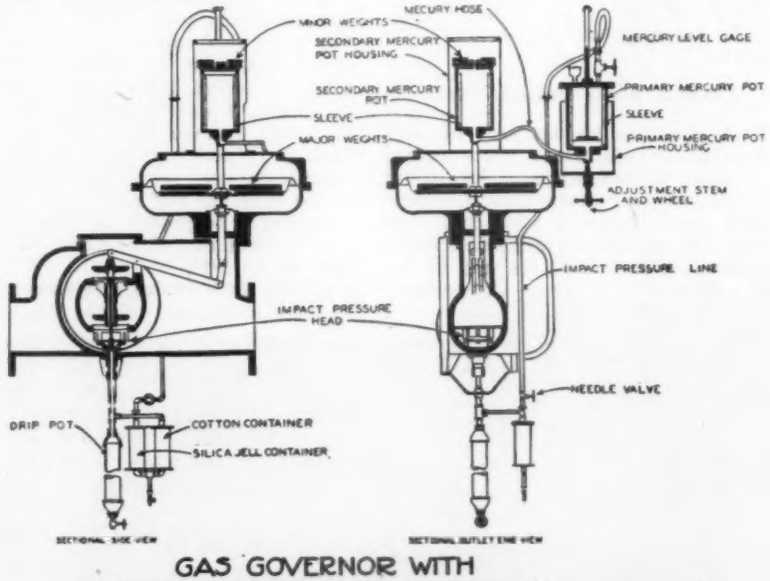


Figure 1

secondary mercury pot when increases in pressure of more than one or two inches are desired. Any degree of pressure increase may be had by varying the size of the mercury containers and their relative elevations. Higher secondary operating pressures may be obtained by placing major weights upon the governor diaphragm within the bowl and using minor weights on top of the secondary mercury pot. The elevation of the mercury in the primary mercury pot should be adjusted so that the mercury just enters the secondary pot at the minimum gas output demand.

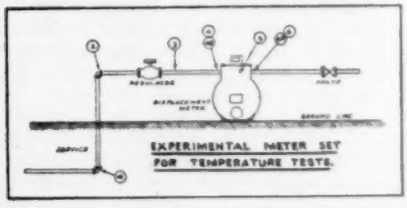
"While we have had good results by operating governors of this type on variable primary pressures, our best results have been obtained from fairly uniform pressures as, for instance, 35 to 40 pounds per square inch. However, variations of from 8 to 10 pounds pressure do not appear to do harm providing the fluctuations are not too sharp.

"Figure 2 shows a 24-hour chart from the low pressure system, which is fed by the pressure boosting device outlined above."

Report of Measurement Committee Natural Gas And Transmission Division

Thermometer Tests

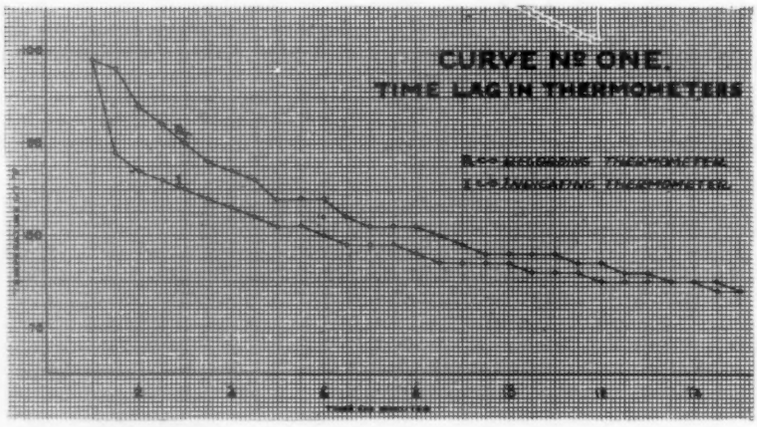
TO observe the effects of varying temperature on recording thermometers, an experimental set-up was made consisting of an underground service with regulator, displacement meter and piping above ground exposed to sunlight. Both recording and indicating thermometers were located at various places along the set-up, as follows:



No. 1—Recording—Underground Service; No. 2—Indicating—Regulator Inlet; No. 3—Indicating—Regulator Outlet; No. 4—Indicating—Meter Inlet; No. 4R—Recording—Meter Inlet; No. 5—Indicating—Meter Body; No. 6—Indicating—Meter Outlet; No. 6R—Recording—Meter Outlet.

Gas was passed through this set-up at various temperatures and at various rates of flow to compare reading of indicating thermometers with reading of recording thermometers at same location.

With the recording thermometer bulb in brass well, the readings were within two degrees of indicating thermometer readings at the same location, while with the recording thermometer bulbs directly in the gas stream without wells, the reading checked within one degree of indicating thermometer readings at the same location.



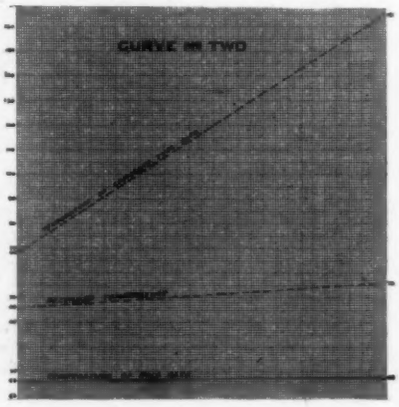
During these tests it was noticed that there was a time lag of the recording thermometer behind the indicating thermometer, and for this reason enough gas was passed through the meter before readings were taken to allow the two types of thermometers to adjust themselves. Tests made show that approximately fifteen minutes are necessary for the two types of thermometers to adjust themselves. Curve No. One gives a graphic presentation of this time lag. In actual measurement work this time lag should have no effect, as any error should be compensating.

Tests were also run to determine the effect on recording thermometer readings of long exposed capillary tubes. The bulb of a recording thermometer was placed in a constant temperature water bath while the capillary tube was coiled up and placed in another water bath which was heated to various temperatures. These tests are graphically presented on Curve No. Two. It will be seen that while the capillary tube temperature was increased ninety-six degrees above that of the bulb, the effect on the recorded reading was only four degrees.

Critical Flow Orifice Tests

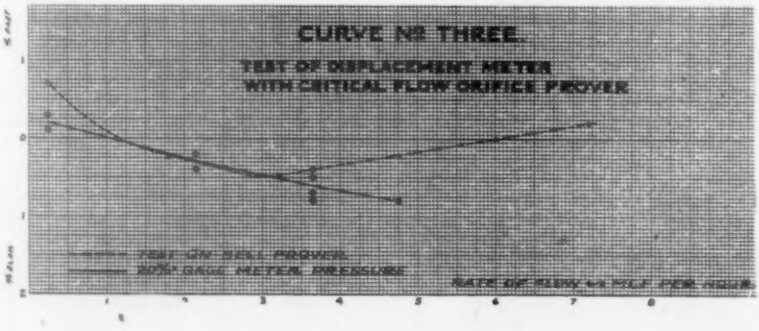
TO determine the accuracy of large volume displacement meter testing in the field by use of critical flow orifice provers, a large volume meter was first tested in the shop with a 100 cu. ft. bell prover and then tested in the field under pressures of 20 lbs., 40 lbs. and 60 lbs. are various rates of flow. Comparisons were then made of tests secured by the two different methods. The results of these tests are graphically presented on Curves No. Three, Four and Five.

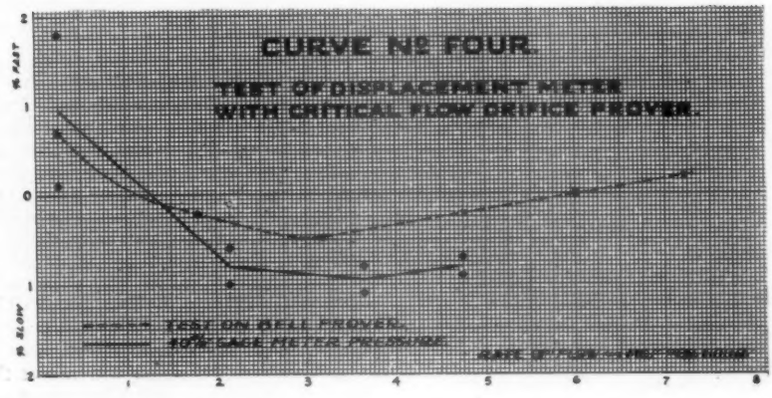
These tests seem to indicate that with increasing pressure, the tests obtained by critical flow prover become less close to those obtained with the bell prover.



This is to be expected, as with increasing pressure the meter differential, for a given index speed, becomes greater and consequently the proof is affected. The tests also indicate that proofs obtained by this method are sufficiently accurate to accept, but that meters should be proved, if possible, at the same pressure and average rate used in actual service. Where high capacity displacement meters are proved by bell provers in the shop, the test rate should be sufficiently fast to produce a differential as high as that caused by increased pressure in the field.

Critical flow orifice sets should have





the air time checked periodically, preferably at the factory.

Report of Sub-Committee of Domestic Meters

Curb Meters

THE following is a list of the advantages and disadvantages which gas utilities, using curb meters, contend accrue due to their use. No attempt has been made to list them in the order of their importance.

Advantages

1. Lessens utility liability in case of explosion or fire.
2. Accessibility:
   (a) Possible to read all meters.
   (b) Possible to read more meters per unit of time.
   (c) Check premises for leakage at curb.
   (d) Increased safety in case of fire.
3. Decreases Unaccounted-for Gas:
   (a) Eliminates loss in services.
   (b) Eliminates all high pressure gas on consumer's premises.
4. Better Public Relations:
   (a) Eliminates estimation of bills.
   (b) Keeps utility employees off consumer's premises, unless called on to adjust appliances or on complaint.
   (c) Eliminates dog nuisance.
   (d) Neater appearance.
   (e) Consumer's express preference for curb meters.
5. Reduces tampering and by-passing.
6. Meter is protected against injury or accidental blows.
7. Stuffing box leakage decreased.
8. Measurement:
   (a) Greater accuracy due to more uniform gas temperature.
9. Expedites service;
   (a) Turn-ons.
   (b) Closes.
   (c) Each consumer has separate service.
10. Locked Meters:
    (a) Non-payment.
11. Eliminates all discussion as to the meter location.

Disadvantages

1. Possibility of additional liability in case of harm to the public resulting from broken curb box covers.
2. Impractical in cold climates.
3. Change of location of set in case of street widening or other street improvements.

In conclusion it may be said in all fairness that the use of curb meters may be extended considerably by Pacific Coast Utilities. The climate here, particularly of the central and southern portions, is ideal for their use and continued study of their advantages will, no doubt, recommend their use in various installations. The Meter Committee does not feel that sufficient time has been spent in research to advocate their uses at this time, but it does state that any effort spent in their investigation will more than pay in the results obtained.

One Southern California gas utility has given a great deal of time and effort to the study of their merits and as a result are seriously contemplating using them all on new sets. What effects this policy would have in the case of utilities serving intensive, rather than extensive areas, are not entirely evident at present, but the very fact that one large progressive utility is giving this policy serious thought, recommends that the least the rest of the industry can do is to give the subject serious consideration.

One recommendation the Committee can make without fear of question or contradiction is that this vital factor in gas distribution be given more thought and investigation by future committees.

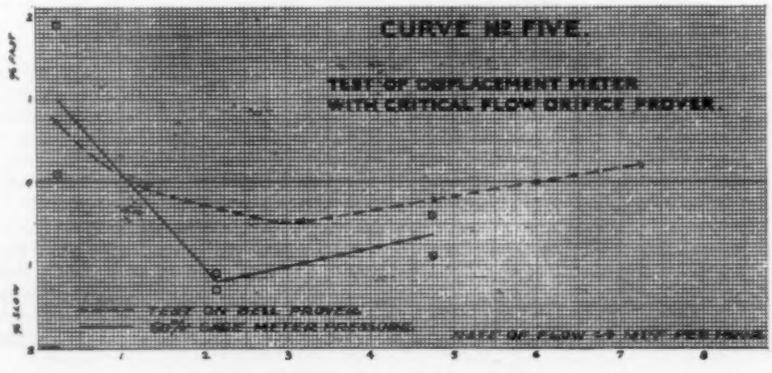
Tin-Meter Setting

THE latest development in meter connections is the "meter," or "rigid" bar. This bar is a rigid connection from the service riser to the house piping. Offset swivels make it possible to connect the meter to the bar. When properly installed this connection removes all strain from the meter. In practice the rigid bar may be tied in with the meter setting problem at the point where the service crews are laying the services. Idle time resulting from present operation may be used to complete the installation which will greatly simplify the work of setting the meter on the consumer's premise. This type of connection will expedite service to the consumer, make standardization more easily realized, result in neater and more workmanlike installations and improve manifold sets. Where a meter is removed from active service it is only necessary that the meter and swivels be removed; the bar remains in position, ready for the next call for service.

The degree of success realized by the adoption of a rigid bar policy will be measured directly by exactness of offset swivel machining, alignment of tube screws on the meter; on the part of the manufacturer and the alignment of tube screws of meters passing through the meter repair shops.

Where these bars are used it will be absolutely imperative that meter tube screws and offset swivel screws be plane and that the plane of the screws be normal to the face of the meter washer. The full realization of these requirements may be attained by furnishing installation crews with jigs to properly align all bars. Any deviations from these specifications will result in meter strains with resulting leakage while strict appliance to them will result in improved service.

The practice of some of the operating companies of using both tin and iron meters has some effect upon field operation in that at times it is necessary to replace tin with iron meters, but no particular difficulty is experienced because the substitution of the proper offset swivels to fit the iron meter is all that need be done to effect the change. This substitution may alter the appearance of manifold sets and be displeasing to the eye of the aesthetic but the efficiency and service rendered will not be effected.



A study of costs of meter installations was made to determine the efficacy of the plan outlined above; i.e., to apportion the work between the service and meter crews in using the rigid bar. Comparative costs between this method and the conventional direct piping system were also compiled and indicate that direct savings on installations in favor of the rigid bar amount to approximately ten cents on high pressure sets and thirteen cents on low pressure sets. Additional savings will be realized after the adoption of the rigid bars, in possible meter crew reductions and decreased time necessary when the consumer calls for service.

Report of Customers Accounting Special Problems Committee

High Bill Complaints

MANY utility companies have adopted the plan of concentrating all the work of high bill complaint handling in one department. This assures prompt and efficient attention for each complaint, by men who have been especially trained for such work. An analysis of the results obtained clearly indicates that this plan is superior to that of having complaints handled by employes who have other duties to perform. By centralizing this work, full time can be devoted by the complaint force to handling all complaints received from customers in person, by letter and by telephone. Separate small offices or consultation rooms should be provided, so that each customer can be interviewed in an atmosphere conducive to reasonable discussion, instead of at an open counter where both the customer and the complaint clerk are subject to the disturbing effect of other conversations around them.

The equipment of the high bill complaint clerks should include the following: A manual or hand-book outlining the company's policy and procedure; chart of average consumptions for typical installations, both domestic and heating; degree day table showing heat deficiency factors of normal months compared with actual months of past year; chart showing consumption per hour of the most commonly used appliances.

A customer calling at the office to complain of a high gas bill should be directed by the reception clerk to a consultation room and introduced to the complaint clerk, who should receive the customer in a friendly and sympathetic manner. The complaint clerk should listen attentively while the customer states his complaint, and then send for the record of the customer's account which should be scrutinized for any possible error in calculation of the bill or irregularity in meter reading dates. At this point the clerk should determine whether or not the bill in question is really a high bill. He should do this by applying a "yardstick" consisting of a record of the average normal bill for similar installations. This is very important as the entire procedure should vary depending upon this point.

If the bill appears to be higher than normal the clerk should question the customer as to the use of his appliances, whether there has been any unusual circumstances which might account for the high bill. Some of the causes of high bills may be mentioned, such as:

An increase in the family
Carelessness in use of appliances
Ignorance of economical use of appliances
Indifference to operating cost
More than ordinary amount of entertaining
Misunderstanding of period covered by bill
Poor adjustment of burners
Oven burners used for heating kitchen
Improper water connections at water heater.
Errors in meter reading

If no information is elicited from the customer to account for the increased consumption and it appears possible that the meter may have been overread, it should be suggested that the customer send in his own reading of the meter on a dial postal card furnished him, and that the company will, in case an error has been made, render him a new bill based upon his own reading. Or if the customer prefers, a re-reading should be made by a meter reader.

During the discussion the clerk must, of course, maintain a friendly attitude, using extreme care not to confuse or antagonize the customer. The ability of the customer to know the amount of gas used should not be questioned. Thus the temperamental person is not angered, and unnecessary friction is avoided.

If, during the interview, the clerk sees that he is not going to satisfy the customer, he must decide whether to send an inspector to make a high bill investigation, have the meter re-read or order the appliances adjusted. If the customer is fairly certain that an appliance is faulty, an order to adjust such appliance may suffice. In the majority of cases, however, when the customer cannot be satisfied at the office, a high bill investigation must be made upon the customer's premises. The clerk informs the customer that an inspector will call, and using a High Bill Investigation form, he fills in the name, address, meter number, last reading and date, and consumption by months for the past year. Upon this form is also entered a synopsis of statements made by the customer when making the complaint, as a guide for the inspector in making his investigation.

Complaints received by telephone can be handled practically the same as those from the customer who calls in person. Those received by letter must, of course, be written up on the High Bill Investigation form and sent out with an inspector.

In smaller companies and district offices of the larger companies, where the volume of complaint traffic does not warrant the set-up described here, a member of the customers department can be assigned to interview all complainants and order necessary investigations. The chief clerk should follow each complaint closely and refer aggravated cases to the district agent or manager.

Field Investigation

The method of approaching the customer at his home is of utmost importance, as a bad impression made by an inspector may offset the good intentions of the company and defeat the purpose of the investigation. Doubt on the customer's part of the inspector's ability, destroys confidence, which must be preserved at all cost. The inspector must be well qualified not only for good workmanship, courtesy and tactfulness, but must listen attentively to the customer and have a general appearance which will reflect the standards of the company he represents.

The inspector calling upon a customer who has complained of a high gas bill is furnished with the High Bill Investigation form described above, also reports on previous complaints if any. A careful study of this data before calling at the customer's premises will greatly assist the inspector in completing the investigation.

The inspector should present himself at a rear door and, without hesitancy, proceed with the investigation in a business-like manner, first inviting the customer to remain with him. The condition of the meter should be noted and the present reading entered in a space provided in the investigation form. The house lines should be tested for leaks, minor adjustments made to appliances if needed, pressure regulated and helpful suggestions offered for the most efficient use of appliances. If any faulty appliance is found, its condition should be reported to the service department. If there is any evidence of waste through careless use of the service, the inspector shows the customer where and how the excessive amount of gas is used and suggests a remedy for it. This must be done in a tactful manner. The inspector must avoid any appearance of desiring to argue with the customer. His job is to investigate, and to convince the customer of the company's interest in his complaint.

On the investigation form the inspector should enter in addition to the meter reading, the name and size of appliances in use, date installed and average and maximum demand; also a record of operation tests of all appliances, in spaces provided in the form.

Satisfying the Customer

Following the inspection, a letter should be sent to the customer, informing him concerning the results of the inspection. While a verbal explanation of the inspector may, in many cases, be satisfactory to the customer, a written reply in every case gives the company a definite record. The letter should be brief, merely stating the date of the inspection, condition of the meter and appliances and correctness of meter reading.

In a small minority of cases the inspector's report will indicate that the customer has not been satisfied. These must receive special consideration. Usually those not satisfied by the investigation are persons who still doubt the accuracy of the meter. They naturally want it removed

(Continued on page 90)

The Legal Side of Our Industry

Leo T. Parker discusses

- **Responsibility for Explosion**
- **Non-Liability for Violation of Ordinance**
- **Liability for Injury to Contractor's Employee**
- **Law of Disabled Trucks**
- **High Bidder Bound to Take Bonds**
- **City Liable for Breaching Contract**
- **Excessive Judgment Reversed**
- **Purchaser Interest in Undiscovered Gas**

When Gas Company Is Responsible for Explosion

CONTRARY to the opinion of the majority of persons it is not contributory negligence on the part of a property owner to use a match or lighted candle in trying to discover a gas leak, or to enter a cellar or other closed place into which gas is escaping. In such cases the question of contributory negligence is to be determined by a consideration of all the circumstances, such as to the extent of the leak, the size of the enclosure where located, and the length of time the leak has existed.

On the other hand, it is established law that if a property owner has notice that gas is present in *large* quantities, it is negligence for him to apply a lighted match to it. However, if the quantity is small, or if there is nothing to cause a man of ordinary prudence placed in the same situation to believe that there is danger of an explosion, it is not necessarily negligence to light a match. Notwithstanding these facts a gas company not always is liable for an injury to a consumer where it is shown that an explosion may have been avoided had the latter exercised ordinary care and employed a plumber to investigate the source of escaping gas.

For instance, in Newland V City of Winfield, 289 Pac. 402, it was disclosed that a city was supplying gas to its citizens. Before moving into a house rented, a tenant requested the city to install a gas meter and connect the house with the gas mains. No test of the pipes in the house was made by the city. After the tenant turned on the gas himself without notice to the city or the calling of a plumber to test the pipes, he smelled an odor of gas and when investigating to locate the leak an explosion occurred. The tenant sued the city for the injuries sustained on the contention that the city was negligent in failing to test the lines before he was instructed to turn on the gas. However, it is interesting to observe that the Court held the city not liable, saying:

"Even if it was the practice of the city to inspect pipes before turning on the gas, such a test could not be made by the city until the occupants of the house had made the connections which they undertook to make. . . . If it was the custom of the city to make an inspection before turning on the gas, the occupants knew that the city had stopped at the installation and test of the meter, and that no inspection of the pipes in the house had been made. . . . When they turned on the gas and discovered the odor of it, was the proper time to shut it off and call a plumber or employee of the city to find and mend the leaking pipes."

In still another leading case, Plonk V. Jessop, 178 Pa. 77, a person had smelled gas and lighted a taper and searched along the pipes to a point where an explosion took place. The question presented the Court was whether it was a case for submission to a jury as to the gas company's negligence. The Court said:

"The knowledge of the explosive character of gas certainly may be presumed to be general among persons who have it in their houses, and plaintiff (consumer) admitted such knowledge. But how far a smell of gas indicates a leak that may safely be searched for with a match or candle, and at what point it means danger of explosion in so doing is a question requiring judgment and some experience. Plaintiff had seen indications of a leak, had seen it searched for by defendant's men with matches and a light, and had then been told that everything was right. When, after that, he smelled gas, it could not be said, as a conclusion of law, that he necessarily had reason to suppose that he would find anything more than a leak that might be safely searched for with a light as he had seen done by defendant's men earlier in the day. He may have been negligent in going into the attic as he did, but we think it is for a jury, and not the Court, to say so."

Violation of Ordinance Does Not Result in Gas Company's Liability

Generally speaking, in actionable negligence, with respect to an obligation imposed by a city ordinance, in order to secure a recovery for injuries, it must be shown that the injury was under the contemplation of the purposes of the ordinance, which the ordinance was created to prevent. In other words, the mere fact that a gas company violates an ordinance does not indicate conclusively that this violation may result in a verdict in favor of a person who is injured partially as a result of the violation.

For example, in Miller V East Ohio Gas Co., 172 N. E. 300, it was disclosed that a city ordinance provides that gas meters shall be placed in private residences "four (4) feet above the floor and as near a window as possible, with an unobstructed passageway leading thereto." A woman was seriously injured when she walked into a gas meter which was only thirty-two inches from the floor. She sued the gas company for damages on the grounds that the latter had violated the above mentioned city ordinance. The Court held the gas company not liable, saying:

"The gas meter, whether at thirty-two inches or four feet above the floor, has no connection, in our judgment, with the safety of the tenant. It is not unreasonable to say that one of the purposes of the placing of the gas meter was to establish uniformity, but it cannot be said that the height of the gas meter had any effect or was intended to bear any result which might affect the safety of the tenants."

Gas Company Liable for Injury to Contractor's Employe

While it is generally believed by the majority of gas company officials that a company is relieved from liability, where an injured employe is hired and paid by a contractor, yet the contrary was held by a higher court in Seabury V Natural Gas Corporation, 127 So. 25.

Here it was proved that a truck owner rented the vehicle and its driver to a gas company at a stipulated sum per day. The driver was injured while performing his regular duties and sued to recover compensation from the gas company. The counsel for the latter argued that the owner of the truck was an independent contractor and solely liable. However, the Court held the gas company liable, saying:

"One employing an independent contractor is liable for the death of one working for the contractor, if the workman was an employe and not himself an independent contractor."

Law of Disabled Trucks

It is well settled that a driver of a gas company's truck may lawfully leave the disabled truck on a highway at night time, if warning lights are illuminated, and under ordinary circumstances the driver of another vehicle which collides with the truck is deemed to be negligent.

For illustration, in Ligon V Service Co., 22 S. W. (2d) 1058, it was disclosed that a person named Ligon was riding on a large motor-truck when the rear axle upon the vehicle broke necessitating stopping. The pavement of the road was eighteen feet in width. The driver of the truck sent for a mechanic to make the required repairs. While waiting for the mechanic to arrive a passenger vehicle collided with the truck seriously injuring Ligon who was standing nearby. He sued the owner of the passenger car for damages. The latter attempted to avoid liability on the contention that the driver of the truck was negligent in permitting it to remain on the highway.

However, the Court held the accident

resulted from negligence of the driver of the passenger vehicle, resulting in the latter's liability, stating the following important law:

"There was ample space left on the pavement for vehicles to pass around the truck. At this point the road was practically level with inclines therein to the north and the south. It was not entirely dark but the headlights and tail light on the truck were lighted. . . . 'Negligence' means the want or lack of the highest degree of care; and by the term 'highest degree of care' is meant the highest practicable degree of care which would be used by a person of ordinary care and caution under the same or similar circumstances."

High Bidder Bound to Take Bonds

In Kern V City of Mt. Sterling, 25 S. W. (2d) 41, it was disclosed that a city council unanimously passed an ordinance calling an election to be held on the regular election day for the purpose of permitting the voters of the city to determine whether it should issue bonds for certain public necessities. The issue was voted and the council passed another ordinance providing for the advertisement of bids for the purchase of the bonds.

After a sale to the highest bidder the bonds were duly prepared and tendered to the purchaser but he declined to pay the amount of the bid on the grounds that the ordinance calling the election, which was for the single purpose of making the purchase, while the question propounded to the voters authorized the expenditure of the funds to be derived from the bond issue for the additional purpose of making repairs and changes in public buildings to permit installation of the subject of the purchase. The highest bidder argued that his view was correct because a state law clearly provides that money obtained from a sale of bonds by a municipality cannot be used for a purpose different from that for which it was voted.

Notwithstanding this contention the lower Court held the bond issue valid, stating important law as follows:

"If the law should be determined that the funds of the involved indebtedness herein could not be spent for any other purpose than the purchasing of the equipment, it seems to us it could not affect or militate against the duty of defendant (purchaser) in this case to pay for the bonds, which is the only question involved, and which is quite beside the one as to the purposes for which the proceeds when so paid may be expended by the city."

City Liable for Breaching Contract

Generally speaking, a municipality may be liable in damages for breaching a valid contract whether the agreement relates to the sale and supply of gas, or other legal objects.

For instance, in Oklahoma Natural Gas Corporation V Municipal Gas Co., 38 F. (2d) 444, it was disclosed that the Muskogee Gas & Electric Company and the city of Muskogee entered into a written contract. It was agreed that the company would build a gas pipe line along the right of way of the city water system from a point in the city to a connection with the pipe of the Mid-West Casket Company, to enable the city to supply gas to that company and other consumers, and that line was leased to the city for such purpose. In consideration therefor, the city leased to the Muskogee Gas & Electric Company a gas pipe line it owned and then in use by the company to supply gas to domestic consumers, extending from a reducing station in the city to its waterworks plant. The city conveyed to the company a perpetual right of way for a gas pipe line over the city's water system line from a point in the city to the Muskogee Country Club, with a permit to lay and maintain thereon a gas main and connecting pipes to supply domestic consumers. It was agreed the leases should remain in force and effect until cancelled, upon written notice of 90 days by either party, or by mutual consent, with the privilege reserved to the company to remove its pipes and other materials, within a reasonable time, not to exceed six months.

The company built the line for the use of the city, as agreed, and on its completion used the city's line, and in all things complied with the terms of the contract. Thereafter, the Oklahoma Gas & Electric Company became the owner of the contract, and for a long period utilized the city's line, with the approval of the city. The two predecessors of the Oklahoma Natural Gas Corporation, with the acquiescence of the city, constructed lateral lines from the city's line to the premises of their gas consumers. On March 1, 1928, the Oklahoma Natural Gas Corporation acquired all the property of those companies and was serving 98 consumers at Muskogee, in addition to the city.

The city breached the contract, without notice, by executing another contract with the Municipal Gas Company of Muskogee, whereby that company was authorized to connect its pipe line with the city's line, and furnish gas to the city and to customers upon that line.

The Municipal Gas Company proceeded to disconnect the Oklahoma Natural Gas Corporation's line from the city's line and to connect its own line therewith, and to solicit contracts from the latter's customers and by threats to cut off and reduce the price of gas, took over 79 of its customers.

The Oklahoma Natural Gas Corporation filed suit against the city and the Municipal Gas Company. The lower Court held the former not entitled to relief, but the higher Court reversed the verdict, saying:

"The decree is reversed, and the cause is remanded to the trial Court, with direction to enter a decree requiring the appellee (city) to disconnect the gas supply of the Municipal Gas Company from the line the city leased to appellant (Oklahoma Natural Gas Corporation), to allow appellant to restore its connection with that line and use the same for the distribution of gas by contract with customers, and to enjoin the defendants (city and Municipal Gas Company) from interference therewith or furnishing gas to customers on said line, until the contract may be terminated upon notice as stipulated by its terms after such disconnection and restoration, and with the further direction to award appellant (Oklahoma Natural Gas Corporation) such damages against defendants as may be susceptible to legal proof for loss of the sale of gas to the date of said decree."

Excessive Judgment in Favor of Property Owner Is Reversed

While it is settled law that a gas company is bound to pay the reasonable value of private property appropriated for public purposes, such as laying a pipe line, yet a higher Court ordinarily will not approve a verdict for damages rendered by a lower Court in excess to the actual value of the land.

For example, in Warfield Natural Gas Co. V Alley, 25 S. W. (2d) 724, it was disclosed that a gas company condemned rights of way through certain farm lands for the purpose of laying a pipe line.

The land was creek bottom and was fertile and capable of being cultivated. The easement over the land extended 450 feet, and, being 20 feet wide, equalled .21 of an acre. The lower Court allowed $300 damages, basing its judgment upon testimony given by witnesses for the landowner. However, it is interesting to observe that the higher court reversed this decision, saying:

"Witnesses for the landowner merely expressed opinions as to the damage done to the property and the value of the land taken. Those opinions were predicated upon the idea that the land was destroyed for all purposes in so far as the owner is concerned. Extravagant values were placed upon the land taken, and the consequential damages were equally exaggerated. . . . For the reasons suggested here the judgment is reversed because excessive."

In still another recent and leading case involving the same point of the law, the lower Court allowed $500 to a farm owner for the use of a strip of land 20 feet wide and 59 rods long. As to this strip, a 20-inch pipe was buried in the ground at a depth of about 2 feet or more and a telephone line strung on 4 or 5 poles planted in the ground.

In holding the judgment excessive, the higher Court said:

"There is no evidence whatever that any damage was done to any crops or fences of the farm in the construction of this pipe line. . . . There is no evidence that any portion of the farm was taken or damaged by the construction of the pipe-line except the strip 20 feet wide and 59 rods long through which the easement runs. . . . It is true this strip runs through the bottom lands of appellee's farm—the most fertile and best part of his land. But conceding all that the appellee says of its fertility, the Court knows as a matter of common sense that the price of $1,000 per acre which the appellee

(Continued on page 90)

EQUIPMENT NEWS

Automatic Gas Burners for Rectangular Furnaces and Boilers

The Barber Gas Burner Company, Cleveland, Ohio, has just issued a supplement catalog No. 31 describing their gas burners built for rectangular furnaces and boilers. Illustrations show the burner unit, and how it is installed in sectional boiler. The main feature of the catalog is the "Specification Chart for Rectangular Boilers," which fills five pages. Specifications cover each type of boiler giving

width and length of firebox at grate level, number of burner units, type size of manifold, number of controls, natural gas capacity in cu. ft., manufactured gas cu. ft., radiation steam per sq. ft. and water per sq. ft., with prices of each. In referring to table of specifications, they state there are two major factors which must be given consideration in conversion burners. First, an efficient and economical type of burner. Second, the adapting of this burner to the combustion chamber of the heating appliance, so as to take advantage of every square inch of heating surface, and apply the heat in the particular manner for which the heating plant is designed.

To meet the demand of the gas industry, it is essential that every burner sold to the trade be designed for the particular heating plant in which it is to be installed, and it is for this reason that every Barber Burner assembled for installation in a sectional boiler is built to specification with the correct type units to fit the combustion chamber, the same as if it were standard equipment for the particular boiler.

When you stop to consider that there are over two thousand different sizes of sectional boilers whose grate dimensions range from 15" in width to 48" in width, you can have some slight conception of the impossibility of any manufacturer making four to six sizes of burners which are supposed to properly take care of over two thousand various size boilers.

The purpose of the specifications shown in the latter part of this supplement No. 31 catalog is to enable the gas companies and heating trade to first carefully measure up the boiler to determine the actual grate dimensions, and the amount of radiation or load which the boiler is carrying. With this information he can then quickly refer to the specifications and determine the burner recommended for that particular size boiler.

His next step is to refer to the amount of radiation which the burner as shown is designed to carry. If the boiler is not actually overloaded, and the radiation is less than that shown for the maximum capacity of the burner, he can then immediately quote his customer as to the prices for burner or installation.

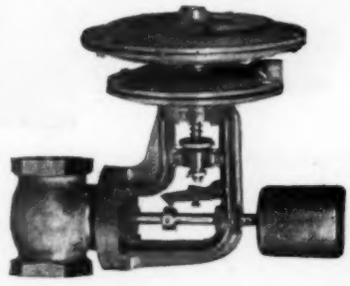
If he is successful in obtaining the order he then attaches to his order for the burner, a carefully filled out specification data sheet. This data sheet goes into the assembly room, and the burner is built to absolutely conform to the dimensions as shown. As an added precaution, we require the Manufacturers' Name and Number of the particular boiler be furnished us, and maintain a complete file of catalogs, blue prints, etc., of every manufacturer of coal-fired appliances.

The dimensions with which we are supplied are checked against the boiler manufacturers' data, and if it is found there is a discrepancy, more complete information or a re-check is requested before the burner is assembled and shipped. In this way every conceivable effort is made to be absolutely certain that the correct burner assembly is furnished for each installation.

A copy of catalog will be mailed on request.

"Duplex" Automatic Safety Shut-Off Valve

The North American Manufacturing Co. 2910 E. 75th St., Cleveland, Ohio, have issued a leaflet describing their new Automatic Safety Shut-Off Valves. They are designed to protect against failure of either gas or air in gas burner installations, and automatically stops the fuel supply if either the gas or air fails for any reason. The operation is simple.



The release latch is set by hand and holds the gas valve in the open position as long as the combined normal pressure of the gas and air is exerted on the two diaphragms and if either the gas or air pressure fails or falls to the predetermined minimum the latch is released and the weight causes the valve to close tight.

The valve will remain closed until normal pressure conditions have been restored and the release latch has been reset manually.

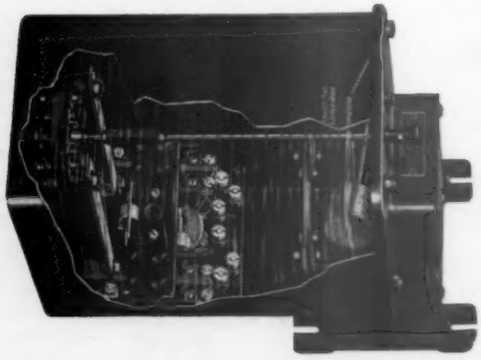
New Heat Cooling Device

The Griscom-Russell Company, New York, have issued a leaflet describing their G-Pin Gas Cooler. The low heat conductivity of air, gases and vapors has always presented a special cooling problem. The G-Pin gas cooler increases the effective area on the side of the heat transfer surface which is presented to the hot gas or vapor. This is done by means of radial pins securely fastened to the outside of the tubes through which the cooling medium flows, thus presenting a much larger heat absorbing surface. Copy of leaflet will be mailed on request.

New Explosion Proof A. C. Starter

A new, explosion proof, across-the-line, automatic starter for A.C. squirrel cage

induction motors is announced by Cutler-Hammer, Inc., Milwaukee, Wis.



Distinguishing this new starter from similar explosion proof equipment is the immersion in oil of its new thermal overload mechanism. It differs from the usual immersed oil dashpot relay and three-pole magnetic contactor in that a newly designed thermal overload mechanism is used with the contactor.

The new starter is designed in keeping with the latest requirements of the Underwriters Laboratories for Class 1, Group D, Hazardous Locations. his includes such installations where Duco, lacquers, gasoline, alcohol, etc., are present in the atmosphere.

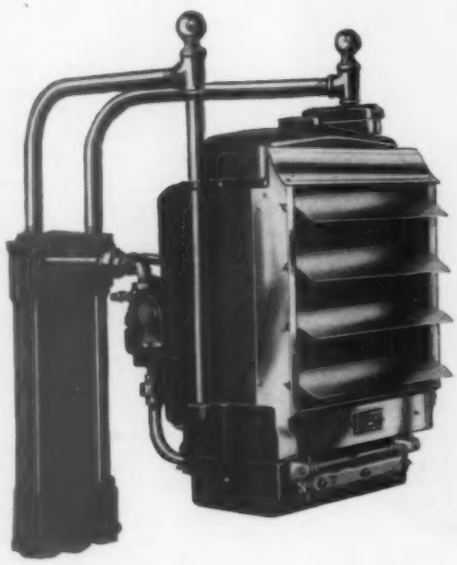
The contacts of this new starter open under a 6" head of oil. A special provision is made for bringing all incoming wires to the terminals below the oil level. A float operated oil indicator shows the oil level. hreaded conduit openings and a compound filled junction box are included.

Being completely oil immersed, the starter is corrosion resisting and therefore suitable for chemical plants, lacquer spray rooms, gas plants, coke plants, etc.

Humphrey Unit Heater

The General Gas Light Company, Kalamazoo, Mich., have issued Catalog U-31-3 devoted entirely to the Humphrey Gas Unit Heaters. his heater has been designed for heating economically manufacturing plants, garages, theatres, store and public buildings. They are designed for ceiling suspension so that they are removed from any interference with the floor area. They are operated by automatic temperature controls so that an even temperature is maintained and are adapted to either manufactured or natural gas.

An important feature of the catalog is several pages of technical data and methods of figuring heating estimates. This material contains a large number of charts, which cover every type of building construction. A copy of the catalog will be mailed on request.



New Line of Tag Flow Instruments

The C. J. Tagliabue Mfg. Co., Brooklyn, N. Y., announces a line of flow instruments completely described in their catalog No. 1020. These new instruments include TAG Flow Recorder-Controllers for Liquids, TAG Flow Meters and TAG Orifice Meters for Gases, TAG Flow Recorder-Controllers for Gases and TAG Liquid Level Recorder-Controllers.

The rate of flow in pipe lines follows the square-root of the differential pressure created at the orifice. Although an instrument may function satisfactorily within its allowable tolerance, at the higher rates of flow, it is particularly important that inaccuracies do not increase at medium and low rates of flow to the same extent that the graduations are compressed. Control work, particularly, demands good accuracy for any rate of flow and this can be accomplished by the use of a chart reading directly in rate of flow but uniformly graduated, like the one shown in fig. 1. This uniformity of graduations is made possible by the special design of the differential pressure gage—one leg of the manometer being made progressively smaller in diameter so that the curved cross-section of this leg produces uniform rise and fall of the mercury in the other leg and uniform motion of the float per increment of change in rate of flow.

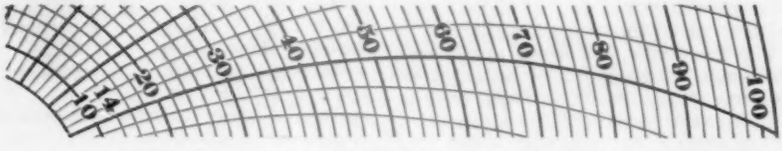


Figure 1

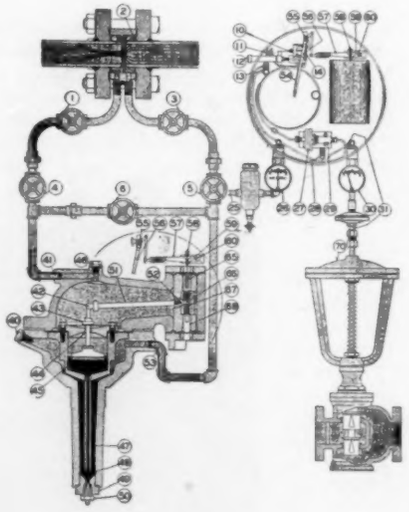


Figure 2

The lever which transmits the vertical movement of the float, engages yoke. This yoke is supported in position by two bellows, one at each end. These bellows being identical are equally affected by pressure changes inside or outside the pressure chamber and balance each other so that such pressure changes can cause no movement of this yoke. At the same time they allow the yoke to move without any restriction up or down as the float falls and rises.

New TAG Flow Meter and the TAG Orifice Meter for gas flow measurement follow in general the construction of the TAG Flow Recorder-Controller for liquids already described. Here too the pressure-tight bearing to convey float movement to the pen has been eliminated. Because gas flow (due to the compressibility of the gas) is a function of the static pressure as well as the differential pressure, these meters have two pens—one for each of these pressures. These two pens operate coaxially on a fixed center of rotation and thus follow the same time mark on the chart. The static springs are easily interchanged should change of static range be necessary.

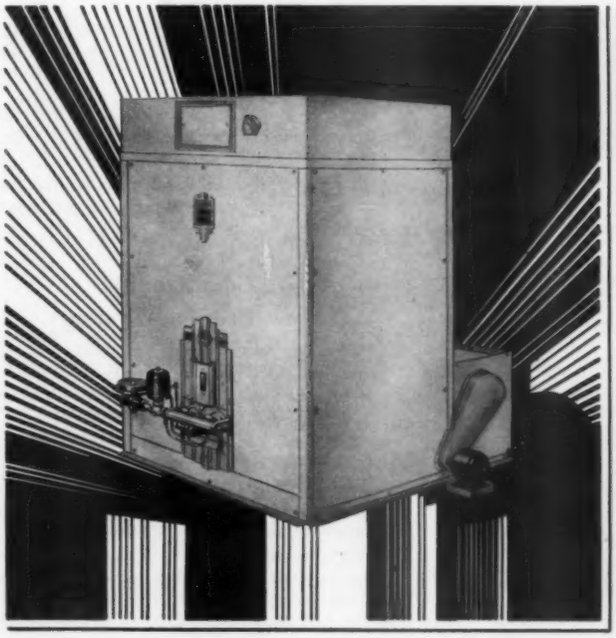
The new TAG Flow Recorder-Controllers for gasses are identical with the TAG Flow Recorder-Controllers for liquids, except that they may have an additional pen actuated by a static pressure spring. The construction of this flow instrument incorporates the TAG Linear-Flow Differential Gage which secures uniform flow graduations and accuracy of control over the entire range from 14 to 100%.

New catalog will be mailed on request.

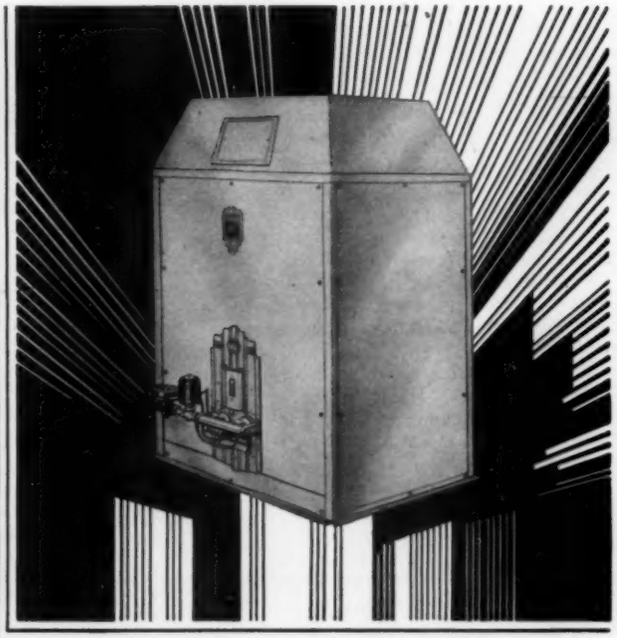
NEW APPEARANCE

THAT COMPLIMENTS

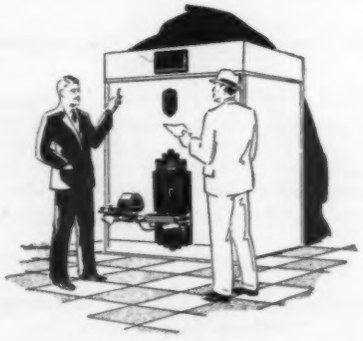
THE MODERN BASEMENT



HEATMASTER



COLUMBUS FURNACE



The public is recognizing and demanding the advantages of Automatic WARM AIR Heating! Architects and builders are recommending it as the truly modern method of home heating. Fully Conditioned Air, so much in vogue, can be obtained only with automatic warm air systems. The Gas Industry has been quick to recognize and foster this trend. Capitalize on this sweeping movement to WARM AIR with the Columbus and Heatmaster Furnaces . . . with that modern appearance that conforms so well to today's demand for livable basements.

SC Surface Combustion

SURFACE COMBUSTION CORPORATION
TOLEDO, OHIO.

SALES AND ENGINEERING SERVICE
IN PRINCIPAL CITIES

NEWS of the GAS INDUSTRY

Appalachian Gas Acquires Empire Corporation

O. H. Simonds, president of Appalachian Gas Corporation, and Floyd W. Woodcock, president, of Empire Corporation, jointly announce the acquisition by Appalachian Gas Corporation of a controlling interest in Empire Corporation. The latter corporation, through subsidiaries, renders electric power and light, natural gas, telephone, water and ice service in more than 250 communities in nine states. Mr. Woodcock will continue as president of Empire Corporation, and will be elected a director and vice president of Appalachian Gas Corporation.

The operating companies in the Appalachian Gas Corporation group constitute one of the larger natural gas operations in the United States and produce and transport natural gas in the States of Texas, Louisiana, Arkansas, Mississippi, Tennessee, Kentucky, West Virginia and Ohio. With the acquisition of Empire Corporation, the total assets of the companies in the Appalachian Gas Corporation group will be in excess of $80,000,000 and will have gross annual revenues in excess of $10,000,000.

"The diversification of utility service, as well as territory served, which this acquisition brings about, is an initial step in a program of further expansion of the Appalachian Gas Corporation, not only in the natural gas field, but into other of the utility branches as well," said Mr. Simonds, adding further, "consolidation of management and reduction in operating expenses and simplifying our capital structure which may be effected with this larger combination of properties should be beneficial to Appalachian."

Gas Utilities Firm Formed

Organization of the Communities Gas Service Corporation, Inc., under the laws of Delaware, with headquarters in Dallas, Tex., for the purpose of controlling and operating natural gas utility companies, has been effected. C. W. Hobson of Dallas, is chairman of the board of directors; C. O. Moore, president; Homer R. Mitchell, vice-president; J. H. Shelton, secretary and treasurer; and C. M. Pierce, assistant treasurer.

Headquarters will be maintained in the Republic Bank Building in Dallas, with branch offices in Kansas City, Mo.; Lewistown, Mont.; Parsons, Kans.; and Vernon, Texas.

In addition to his new position as president of the Communities Gas Service Corporation, Inc., Mr. Moore is also president of the Northwest Gas Company, Montana Communities Gas Company, Kansas Communities Gas Company and Tri-Cities Utilities Company of Regina, Saskatchewan, Canada.

The new firm will start business with a paid-in capital of $205,625. It has acquired the Northwest Texas Gas Company and the Kansas Communities Gas Company, and has a franchise to supply natural gas to Menard, Tex., and the right to take over the Montana Communities Gas Company when the system is completed and in operation.

Two More Towns Added to Iowa Natural Gas Line

The Iowa Poyer and Light Company has purchased the gas franchises in Indianola and Winterset, Ia., and will spend $40,000 in each town in the construction of natural gas distribution systems, it has been announced recently.

Mains will be run to Indianola and Winterset from the 24-inch natural gas pipe line of the Continental Construction Company which passes through the southern part of Warren and Madison counties. Pipe has been ordered for the systems and work on the project has already been started.

Franchise Approved

The New York Public Service Commission has approved the exercise of a new franchise granted to the Central Hudson Gas & Electric Company by the village of Coxsackie for the operation of a gas and an electric system. The company proposes to install a 156,000 cubic foot Butane-air gas plant with a distribution system covering the principal streets of the village. The estimated cost of the plant is $23,000, the cost of the distribution system $20,121. Estimated operating expenses are $9,554.

Erecting Gas Mixing Plant and Holder

A gas mixing plant and a 500,000 cubic foot gas holder are being erected by the Northern Indiana Public Service Co. at the by-product gas center in East Chicago as a part of the program of supplying mixed gas of high heat content to all of the northern region as rapidly as conditions will allow. The mixed gas sent out at the present time is mixed in a small plant adjacent to the East Chicago power plant.

The new mixing plant consists of compressors, yard and holder connections, two small building additions and a gas mixing control equipment.

The holder being erected is a 500,000 cubic foot, three lift, water seal type with reinforced concrete foundation.

The holder is being erected by the Western Gas Construction company of Fort Wayne. All movable sections will be caulk-welded to provide against leakage. The tank, guide frame and crown will be painted with aluminum, while the movable sections will be painted a jet black presenting a pleasing appearance both from the ground and from the air.

The entire project is scheduled for completion during the latter part of September.

Part Of Natural Gas System Completed

The Montana Power Company has completed its natural gas pipe line from the Dry Creek Basin field near the Montana-Wyoming line, to Bozeman, Montana, a distance of 118 miles. Bozeman and all points abounding will be served with natural gas. This is part of the 250 miles of pipe line to be laid. Butte and Anaconda and points enroute will use the gas when the system is completed.

New Propane System

Municipalities Gas Corp. have been granted a franchise for the distribution of gas in the Village of Callaway, Minnesota. Construction of the gas system is now under way. This franchise is assigned to its wholly owned subsidiary, the Detroit Lakes Gas Company, and will be operated from their office at Detroit Lakes, Minnesota.

The gas supplied will be undiluted 2550 b.t.u. propane gas. This makes the third village in the immediate vicinity of Detroit Lakes receiving gas service from the Detroit Lakes Gas Company. It is planned to expand the gas service to all of the villages within a radius of 50 miles of Detroit Lakes, Minnesota.

File Papers Showing Dissolution of Corporation

Officials of the Goshen Gas Company, Goshen, Ind., and the Warsaw Gas Company of Warsaw, Ind., both have filed papers with the secretary of state in Indianapolis showing the preliminary dissolution of the corporations.

Standard Gas & Electric Earnings Show Decrease

Combined net earnings of all subsidiary and affiliated public utility companies of Standard Gas and Electric Company for the twelve months ended June 30, 1931, showed a decrease of 2.68 per cent, as compared with the previous twelve months, according to John J. O'Brien, president of the company. Gross earnings decreased 3.16 per cent.

(News continued on page 82)

now—

•

A *Full Automatic* *Gas Range*

ROPER

Insta-Matic
TRADE MARK

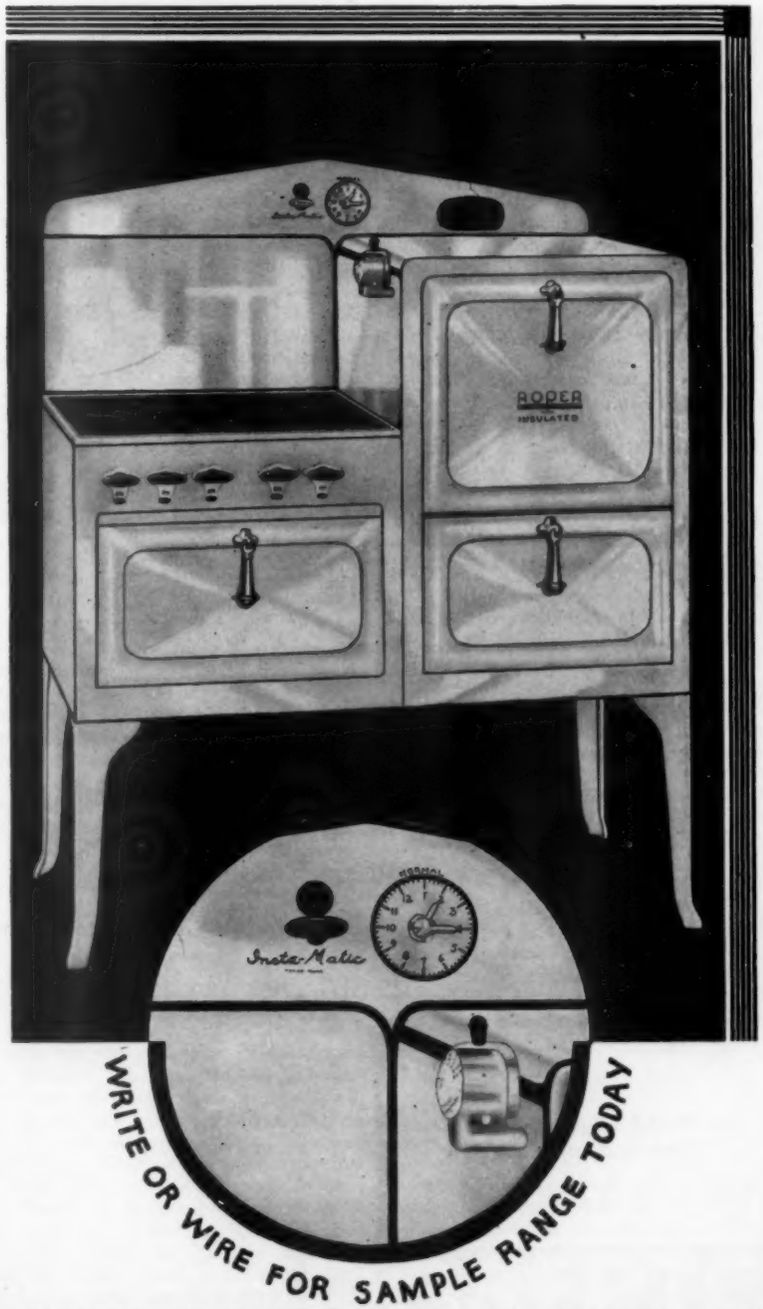
Complete, Positive TIME and TEMPERATURE CONTROL!

In the Roper Insta-Matic Range, the words, "almost human," attain real meaning. The housewife merely sets the clock control—leaves the house—and the gas turns on and turns off at any hour or minute she desires. Automatic operation—both of time and temperature—is complete and fool-proof It is made possible by Roper's remarkable feature that eliminates matches for both oven and top burners— **Insta-Flame.**

The Roper Insta-Matic Range is full-porcelain enameled. All handles are made of heat-resisting Bakelite. Ovens are insulated with long-fibre Rock Wool, packed by hand.

Here is a range containing more selling features than any gas range of any kind ever offered for sale. It gives the Roper merchant an added means of outstripping competition.

Write or wire for sample range today!



GEO. D. ROPER CORPORATION *Rockford. Ill.*

Huge Project Becomes Reality as Big Pipe Line Stretches Across 6 States

Completion of 24-inch natural gas pipe line connecting Chicago and the Great Lakes region with the gas fields of the Texas Panhandle was announced recently by the Continental Construction Corporation. This huge project, in which Cities Service, the Insull interests, Standard of New Jersey, Texas Corporation, Skelly Oil Company, Southwestern Development Company, Phillips Petroleum and Columbian Carbon Company are jointly interested, will make available 175,000,000 cu. ft. of natural gas daily for industrial, commercial and domestic uses. Final tests were completed and the line put in operation September 1st.

The line traverses six states—Texas, Oklahoma, Kansas, Nebraska, Iowa and Illinois—and crosses 13 important rivers which include the Canadian, the Arkansas, the Missouri, the Des Moines and the Mississippi.

As this line stretches across more than 900 miles, it was found necessary to construct ten main line compressor stations to be used in pumping operations. These have a total of more than 70,000 horsepower and are located approximately 95 miles apart near the following towns: Fritch, Texas; Gray, Oklahoma; Bloom, Heizer and Glasco, Kansas; Beatrice, Nebraska; Hastings, Truro and Harper, Iowa, and near Genesco, Illinois.

The initial station located at Fritch, Texas, is the largest gas driven compressor station in the world consisting of twelve 1250 horsepower units, each of the remaining stations being equipped with five 1250 horsepower units. In connection with the initial station there is a natural gasoline absorption plant with a capacity of 72,000 gallons per day.

A complete telephone system, making communication possible from all points along the line, essential to the operation of such a system, consists of 1,287 miles of line using 5,014 miles of wire. In obtaining right-of-way for the line, it was necessary to cross 2,593 tracts of land and obtain the signatures of approximately 8,000 people residing in almost every state in the union and in several foreign countries.

Record-breaking progress has been made on the construction of the line which was started only 13 months ago and many new engineering features have been incorporated. In the preparation of materials used and in actual construction it is estimated that employment has been furnished 10,000 people for one year.

In the opinion of eminent engineers in the East, this is the most important construction project since the transcontinental railroads were built. Backed by gas reserves conservatively estimated at 7 trillion cubic feet, engineers confidently predict that natural gas will be available for use in the Great Lakes region for many years to come.

Fuel Technology Courses at Columbia

The new graduate courses in fuel technology offered in the University Extension of Columbia University of New York include the following of interest to gas engineers:

1. Recent developments in theories of combustion as applied to the gas producer, the blue gas generator, and the utilization of gas.
2. Critical study of heat and material balances with drill in calculations as applied to various methods of gas production and utilization.
3. Theory of coal carbonization and developments in its application.
4. Utilization of oils in the gas industry including blue gas carburetion, reforming processes, liquefied petroleum gases.
5. Discussion of theories and calculations on condensation, scrubbing, heat exchange and purification.

To Build High Pressure Distribution Main

Permission has been granted the Central Hudson Gas and Electric Company to build a high pressure distribution main from its production plant at Poughkeepsie under the Hudson River to the village of Highland and the town of Lloyd, and through the town of Esopus to its production plant in the village of Kingston, and to serve gas in the town of Lloyd and village of Highland. When the line has been built, it is proposed that the Kingston plant will be discontinued and all the gas will be generated at the Poughkeepsie plant. Some time ago the New York State Public Service Commission denied an application to construct this transmission line, but at rehearings the company produced evidence showing that the proposed plant would result in substantial economies and the Commission thereupon decided that the public convenience and necessity would be served by granting the application.

Permission Granted to Extend Gas Mains

The New York Public Service Commission has approved application of the New York Power & Light Company for permission to extend its gas mains in the town of Johnstown and Mohawk and the village of Fort Johnstown and to exercise ranchises granted by these municipalities. The company now has a six inch main extending from the Hudson Valley Fuel Corporation's coke oven plant in Troy through Schenectady to Amsterdam. It is proposed to extend this main along the south side of the Mohawk River to Lock 11 on the barge canal at which point it will cross the river and follow the main highway through Fort Johnstown to a point one mile west of Tribes Hill. It will then turn north and follow a country road to the village of Johnstown. The principal purpose of the extension is to meet an increasing demand for gas in Johnstown and Gloversville which are now supplied from a plant located in Gloversville. On completion of the line, the manufacture of gas in Gloversville will be discontinued, but the plant will be retained for stand-by equipment. The estimated cost of the line is $135,000.

New Gas Storage At Lewiston, Idaho

Gas was turned into the new 40,000 cubic feet holder recently constructed by the Northwest Cities Gas Co. of Walla Walla, Wash. About 1,000,000 cubic feet is being consumed daily in the Lewiston-Clarkston area, served by Northwest Cities, a subsidiary of the Lone Star Co.

Declare Dividend

The Board of Directors of the West Ohio Gas Company has declared the regular quarterly dividend of one and three-quarters per cent on the outstanding 7 per cent Preferred Stock of the Company, payable September 1, 1931, to stockholders of record August 15, 1931.

Convention Calendar

September

17-18 Manufacturers Section, American Gas Association, Book-Cadillac Hotel, Detroit, Mich.

17-19 Heating Equipment Exhibit and Contractors School, Northern Indiana Public Service Company, Hammond, Ind.

18-19 Operating division, New England Gas Association (fall meeting), Wendell Hotel, Pittsfield, Mass. P. R. Buchanan, secretary-treasurer.

22-23 Heating Equipment Exhibit and Contractors School, Northern Indiana Public Service Company, South Bend, Ind.

29-30 Indiana Gas Association, annual meeting, West Baden Hotel, West Baden, Indiana. P. A. McLeod, Secretary-Treasurer.

October

12-16 American Gas Association, Atlantic City, N. J. Alexander Forward, 420 Lexington Ave., N. Y. C., managing director.

12-16 Twentieth Annual Safety Congress & Exposition, Stevens Hotel, Chicago.

22-23 Wisconsin Utilities Association, Commercial Section, Hotel Loraine, Madison, Wisconsin. John N. Cadby, Executive Secretary.

November

16-21 Third Annual Conference on Bituminous Coal, Pittsburgh, Pa.

Is talking gas for home heating

GAS for home heating is rapidly coming into its own. Everywhere—everyone is talking it.

And therein lies your opportunity. If gas companies are ever to ride on the crest of the wave of popularity for their product—that time has arrived.

Why not take advantage of this opportunity now?

ROBERTS-GORDON
APPLIANCE CORPORATION
CURTISS BLDG. BUFFALO, N. Y.

ROBERTS
CONTROLLED
GAS HEATING UNIT

Personals

Col. John Stilwell, Vice-president in charge of industrial relations, Consolidated Gas Company of New York, has been appointed Vice-president and Managing Executive of the Green Mountain Lake Farms, Inc., the convalescent farm at Pawling, N. Y., which is maintained for the benefit of employees of the Consolidated and its affiliated gas and electric companies. This appointment fills the vacancy caused by the death of Walter R. Addicks, Senior Vice-President of the company.

George B. Cortelyou, President of the Consolidated Gas Company, and President of Green Mountain Lake Farms, also announced the following changes in the organization directing the Farm operations:

Oscar H. Fogg, Vice-president in charge of commercial relations for the Consolidated Gas Company, has been appointed to the Board of Directors of the Farm, succeeding Mr. Addicks.

C. H. Stevick, Assistant to Vice-president Stilwell, has been made Chairman of the Advisory Committee of the Farm, and H. E. Nesbitt, secretary of the Advisory Committee, has been made a member.

The Farm is maintained for all employees recuperating from illness or injury or in need of convalescent care.

George H. Shaw, general counsel for the Public Service Company of Colorado, (a Cities Service unit) has been appointed general counsel for the Cities Service Company and the Henry L. Doherty interests in Kansas, Oklahoma and Missouri. He will maintain offices in Denver and Topeka.

W. L. Buelow, formerly assistant manager of the Municipal Gas Company at Wichita Falls, has recently been named manager of the Municipal Gas Company at Hillsboro, Tex.

Mr. Buelow has been with the Municipal Gas Company at Witchita Falls for the past eight years, the last five years holding the position of assistant manager for the company.

H. C. Bretschneider, vice president of the Midwest Refining Company of Denver, Colorado, was reappointed a member of the state gas conservation commission by Governor Adams. His new term expires July 12, 1937.

Robert C. Coffy has recently been appointed manager of the eastern division of the Oklahoma Gas & Electric Company with headquarters in Muskogee. W. S. Van Sickel succeeds Mr. Coffy as vice president and general manager of the Mississippi Valley Power Company and president of the Fort Smith Traction Company.

Mr. Coffy succeeds W. H. Crutcher who died recently. Mr. Coffy has been associated with the Byllesby organization since 1908 when he joined the Oklahoma Gas and Electric Company. Mr. Van Sickel has been associated with the Byllesby organization since 1907, and until recently served as assistant general manager in charge of operation of the Fort Smith Traction Company and the Mississippi Valley Power Company.

Althea Lepper has been appointed Director of the Home Service Division of the Consolidated Gas Company of New York according to an announcement made recently by Oscar H. Fogg, Vice-president in charge of Commercial Relations. She takes the place of Miss Jane T. Wagner, resigned.

Miss Lepper is one of the few women in the country who have college degrees in engineering. She attended Ohio State University, at Columbus, Ohio, and majored in geology. After graduation she became a member of the staff of the American Museum of Natural History, in New York City, working with the Curator of Geology on various fuel research problems. She joined the Consolidated Gas Company of New York in 1928, assigned to the department of utilization.

Miss Wagner plans to resume her studies for a master's degree, according to the announcement. She has been with the company as director of the Home Service Division since 1929.

J. C. Ried was recently appointed Division Manager of the Community Natural Gas Company at Handley, Texas.

B. O. Wood was recently appointed local manager of the Seminole Gas Company, Seminole, Okla.

John E. Johnson recently became the Assistant Treasurer and Assistant Secretary of the Twin State Gas & Electric Co., Boston, Mass., in the place of Bernard L. Kenney who has resigned his position.

Evart L. Henderson has resigned as General Superintendent in Washington District of The Dayton Power & Light Company to accept a position in the engineering department of The United Gas Public Service Co., at Houston, Tex. Mr. Henderson has been connected with The Columbia System for the past five years.

Dr. J. F. Wing, Vice President of the Consolidated Gas Company, Boston, Mass., resigned after rounding out a period of forty-four years' continuous service with the company.

His first position was Chemist of the Company's Everett plant, and thereafter he became Assistant Superintendent, Superintendent, and then promoted to the Vice-Presidency. He was also actively engaged in the operations of the New England Manufacturing company, which manufactured munitions during the World War and ceased active business in 1918; he held the position of Vice-President with that Company.

E. F. Hobbs has been chosen to succeed T. F. Patterson as superintendent of the Bartlesville Gas and Electric Co.

Mr. Hobbs has been with the Bartlesville company for eleven years, the last few years as shop foreman. Previous to entering the service of the Bartlesville company Mr. Hobbs was with the Doherty Research Bureau.

Mr. Patterson, the former superintendent of the Bartlesville Gas and Electric Co. for many years, died very suddenly in Bartlesville on July 8.

Andrew J. Carson, who has worked for the Consolidated Gas Company of New York longer than any other employee, was honored recently on the sixty-first anniversary of his employment with the company.

Mr. Carson, who is at present actively employed in the Distribution Department, holds the company's longest continuous service record. He joined the New York Mutual Gas Light Company on June 14, 1870. This company was subsequently merged with the Consolidated Gas Company.

Since Mr. Carson had previously been associated with a plumbing concern that installed gas meters, his service in the gas industry actually totals sixty-six years.

Elmer Zink has been appointed Sales Manager of the Illinois Power & Light Company, Belleville, Ill.

J. C. Sackman has been appointed merchandise sales supervisor of the Gary Heat, Light and Water Company, Gary, Ind.

O. J. Jawort recently assumed new duties as manager of the Minot, North Dakota, Gas Company.

William Carrick is now in charge of the Mandan, North Dakota, office of the Montana-Dakota Power Co.

Cornelia Lerch Newton has recently been appointed Home Service Director of the New Haven Gas Light Company to succeed Mrs. Jessie Wayman Crowell, who has resigned to return to private life.

Mrs. Newton was granted the Degree of Bachelor of Science as a graduate of the Home Economics College of Cornell University in 1922. Mrs. Newton has had wide experience in cafeteria management, dietetics, teaching, home service organizing and directing. She was Director of the Home Economics and Personal Relations Department of the Elmira Water, Light and Railway Company. She will carry on educational work for the Gas Company.

WELSBACH leadership

during periods of keen competition always insures you steady sales . . .

These are days of careful buying. Close scrutiny of value is the rule . . . And the name Welsbach, backed by 41 years of earned leadership in the gas appliance field, is recognized by Commercial Managers more fully than ever before as a definite factor in making sales.

Welsbach Water Heaters have gained their leadership through their efficient performance (and favorable prices). In fact there is not a single detail of any Welsbach appliance that will not bear close examination by today's buyers. When Welsbach gas appliances are featured, profitable sales are sure to result.

Member of American Gas Association

WELSBACH COMPANY

GLOUCESTER CITY, N. J.

Offices in Principal Cities

TRADE NEWS

E. W. Stitt Appointed Sales Engineer National Radiator Corp.

Eugene W. Stitt has recently been appointed Sales Engineer of the newly-established Gas Heating Division of the National Radiator Corporation, Johnstown, Pa.

A graduate of The Pennsylvania State College, School of Mechanical Engineering, Mr. Stitt has been identified with heating work for over 17 years, serving with the Hoffman Specialty Company as District Representative; with the U. S. Radiator Corporation as Pittsburgh Branch Manager; with Standard Sanitary Manufacturing Company as Heating Supervisor; and with the National Radiator Corporation as Salth Engineer. He is a member of the American Society of Heating an dVentilating Engineers, and is a Past President of the Pittsburgh Chapter.

His broad experience in heating sales and engineering work well qualifies him for his new position.

Ludlow Valve Mfg. Co. to Manufacture in Canada

The Ludlow Valve Mfg. Co., of Troy, New York, makers of the famous Ludlow "Diamond" Hydrants, Double Gate Valves, and the Ludlow Multi-Valves, will manufacture in Canada as The Canadian Ludow Valve Mfg. Co., Limited. Offices are located at 930 Wellington Street Montreal, Que., and factories at Three Rivers, Que., St. Thomas, Ont., and Fort William, Ont.

The company states that, in manufacturing Ludlow Valves and Hydrants in the maintenance of the high quality and Canada, great care will be taken to ensure sociated with the name Ludlow.
workmanship which have always been as-

Hamaker of Republic Steel Now Manager of Sales Promotion

L. S. Hamaker, advertising manager of Republic Steel Corporation, became Manager of Sales Promotion effective August 1st, according to an announcement by N. J. Clarke, Vice President in Charge of Sales. Mr. Hamaker will assume his new duties immediately, making his headquarters at Youngstown.

Purchase Surface Combustion Diffusion Flame Type Furnaces

The Budd Wheel Company of Detroit, Mich., recently purchased from the Surface Combustion Corporation a pusher continuous heating furnace of the diffusion flame type.

This furnace has effective heating length of 20' 0" and will handle 8000 lbs. of work per hour—from atmospheric to 2250° F.—based on billets 2¾" square by 6" long and having a unit weight of approximately 10 lbs.

A bright future is predicted for furnaces of the diffusion flame type by SC officials because of the many advantages of the diffusion flame as well as its broad applicability to process heating and heat treating operations.

New Protective Coating, Announced

"Liquilox," a new liquid protective coating containing no dyes, lamp black, rosin, asphalt, gilsonite, vegetable or animal oils, and offering maximum (and often absolute) protection against all acids, alkalies, salts, indirect heats (from 1400 to 1500 degrees F.), waters, barnacles, termites, and miscellaneous destructive forces that deteriorate woods, fabrics, metals, stuccos, cements, etc., has been introduced to the trade by the Liquilox Company, Ltd., a Los Angeles Concern.

According to the manufacturers, this new protective coating is a product manufactured by secret process from an ore mined in the Western United States. It has been under the process of experimentation for over six years and has proven highly adaptable to the coating of all those surfaces previously mentioned.

It may be applied with either gun or brush; to hot or cold surfaces.

Complete details on this product may be secured by writing direct to Frank Champion, Sales Manager, Liquilox Company, Ltd., 576 Subway Terminal Building, Los Angeles, California.

Westinghouse Appoints James Assistant to Commercial Vice President

William F. James, formerly Middle Atlantic District Manager of the Westinghouse Electric and Manufacturing Company, has been appointed Assistant to the Commercial Vice President of the Atlantic Division of that Company.

Mr. James entered the employ of the Westinghouse Electric and Manufacturing Company in 1909, becoming engaged in industrial sales work in the Philadelphia office. In 1912 he began to specialize in steel mill electrification, and in 1923 became sales manager of the industrial division. In 1925, he was appointed Middle Atlantic District Manager with headquarters in Philadelphia.

Mr. James is a past president of the Electrical Association of Philadelphia, past president of the Engineers Club of Philadelphia, a member of the Industrial Relations Committee of the Philadelphia Chamber of Commerce; and a member and past regional vice president of the American Institute of Electrical Engineers.

Worthington Acquires Metalweld

The Worthington Pump and Machinery Corporation recently acquired the manufacturing and marketing facilities of Metalweld, Inc., Philadelphia, Pa., builders of a complete line of portable compressor units. Last year Worthington took over the manufacture and sale of Gilman rock drills and accessories. This together with the added line of portable and semiportable compressors and other tools, will enable Worthington to supply all air equipment requirements of contractors, railroads, utilities and industrial users.

The portable compressors will be manufactured at the Harrison, N. J. Works of the Worthington Pump and Machinery Corporation, and the engineering, manufacturing and sales personnel of the Metalweld organization also will be located there.

Connelly Iron Sponge & Governor Appoint New England Representatives

The Connelly Iron Sponge & Governor Company, Elizabeth, N. J., announce the appointment of The Gas Equipment Corp., Theo. H. Piser, Manager, 113 Purchase St., Boston, Mass., as their New England representatives, handling their entire line of governors, regulators, purifying material, etc. The arrangement is effective as of September 1st.

New Barber Burner Literature

The Barber Gas Burner Company, Cleveland, Ohio, have just issued a six page supplement to their Catalog No. 30, covering the "M" Series Barber Burners with manual control, "B" Series Barber Automatic Burner with motor gas valve control, and Barber Burners for gas appliances. They have also issued a four page broadside descriptive of the Barber Gas Pressure Regulator.

Tagliabue Company Advances Mr. A. F. Rucks

The C. J. Tagliabue Manufacturing Company of Brooklyn, New York, manufacturers of instruments for indicating, recording and controlling temperatures and pressures, as well as industrial thermometers, has recently announced the promotion of Mr. A. F. Rucks to the position of General Sales Manager.

Mr. Rucks has been connected with the Tagliabue Co. for 18 years and for the past four years has served as assistant to Mr. L. C. Irwin, Vice President of the Company.

(*Trade News continued on page 88*)

Illustrated at the left is the Humphrey Radiantfire Model No. 112 which is patterned after a colonial design which shows a combined influence of Hepplewhite and Sheraton.

This model is but one of 36 attractive period and portable vented models. There is a Humphrey Radiantfire of correct design for every purpose.

The HUMPHREY Radiantfire

Chilly Weather is on the Way and it Will Mean Actual Dollars in Your Pocket

With the coming of chilly fall mornings and evenings, there is a great demand for instant heat - - The Humphrey Radiantfire will meet this demand to the perfect satisfaction of your customers and at the same time will secure a profitable increase in your gas load.

Consider the possibilities of the Humphrey Radiantfire in developing new profitable business.

1st. It is an ideal load builder because of its permanent connection and year around demand upon the gas plant.

2nd. It positively secures new business that requires no increase in capital investment.

3rd. Its maintenance cost is at the minimum because of the quality of workmanship and material used throughout the unit.

4th. It is a builder of good will because of the customer satisfaction created by its efficiency and economy of operation.

5th. Its sales expence is low as compared with other gas appliances.

General Gas Light Company

Kalamazoo - Michigan

44 WEST BROADWAY
NEW YORK

136 BLUXOME STREET
SAN FRANCISCO

Literature on Convertible Engines

The Cooper-Bessemer Corporation has just issued two bulletins which give complete information about the Type GA single and twin-cylinder pumping and drilling engines built by that company.

The first bulletin covers the single-cylinder engine, rated 25 to 60 B.H.P. Two-cycle simplicity, four-cycle economy, and inexpensive convertibility for oil or gas fuel are featured. The twelve pages are devoted mostly to photographs, line drawings, and concise explanations of important engineering points such as: main frame; roller bearings; crankshaft; enclosed crankcase access to moving parts; top location of air valve; governing; cylinder construction; connecting rod; gas injection pump; etc.

The second bulletin deals with the twin-cylinder "deep-hole" engine, rated 65 to 130 B.H.P. Illustrations, data, and technical explanations are handled in practically the same manner as in the single-cylinder bulletin. Since both bulletins contain the very latest information on the improvements which Cooper-Bessemer engineers have made in their 2-cycle oil-field engines, the company is making a wide distribution of this Type GA literature from the Mt. Vernon, Ohio, office—and from the various district offices.

Tagliabue Company Announces New Complete Line Catalog

The C. J. Tagliabue Manufacturing Company of Brooklyn, has just announced the completion of a new General Catalog.

This General Catalog, consisting of more than 100 pages, now places under one cover the complete line of Tag Controllers, Recorders, Dials, Thermometers, Hydrometers, Oil Testing Instruments and Moisture Meters.

Appropriate classifications of the many groups of instruments have been carefully considered and there are many applications of these instruments accurately described and completely listed.

In addition to many applications there is information of active interest to the chemist, laboratory worker, plant and superintendent.

Copies can be obtained on request.

Nordstrom Valves Specified for Long Distance Gas Pipe Line

On the installation of 320 miles of gas pipe for the Montana Power Company line running from Cut Bank to Butte and from Dry Creek to Bozeman, Nordstrom Valves have been specified. These valves, embodying lubricating plugs, will be installed along the entire line for a distance of 320 miles and this comprises one of the larger orders received this year by Merco Nordstrom Valve Co.

The Montana Power Co. line will be 20" pipe from Cut Bank to Butte and 10" pipe from Dry Creek to Bozeman.

On the construction of the new 26" Southern Fuel line running from Kettleman Hills to Los Angeles as an added outlet for surplus gas from this field, Nordstrom Venturi type Valves will also be used.

New Standard Gas Equipment Bulletins

Standard Gas Equipment Corp., 18 E. 41st St., New York have just issued a miniature catalog featuring their heavy duty lines. The booklet includes their newly designed line of Vulcan heavy duty ranges. Two new ranges are described, one their No. 4747 two burner All-Hot-Top range and the other their No. 4746 six burner, open-top range.

The Standard Gas New Equipment Bulletin has also just come off the press. This bulletin describes their new Builders' Specialty Ranges which are especially designed to fit exacting space requirements of builders.

Davis Heads Westinghouse Apparatus Advertising

R. R. Davis who has directed, in the past 21 years, various Westinghouse advertising activities, has been appointed apparatus advertising manager of the Westinghouse Electric and Manufacturing Company, at East Pittsburgh. He will have charge of all apparatus advertising activities of the company except the merchandising department, headquarters for which are located at Mansfield, Ohio.

His service with the company started in 1905, immediately following his graduation as an electrical engineer from the Western University of Pennsylvania, now the University of Pittsburgh. In the next five years he sought experience in engineering, sales management and for this reason, following a course in engineering apprentice work at East Pittsburgh, went to Philadelphia as an advisory engineer and salesman. For two years he also served as electrical superintendent of the Megargee Paper Company.

In 1910 he became associated with the Westinghouse advertising department and in the ensuing period had directed the activities and had executive control of most of its divisions. In 1925 he was named assistant to manager of the department and last year became editor-in-chief.

Mr. Davis had been active in the creative as well as the executive side of every form of advertising, and its associated media and methods, that has been used by the Westinghouse Company.

McWane Cast Iron Pipe Catalog

McWane Cast Iron Pipe Co., Birmingham, Ala., have issued a 44 page catalog, size 6" x 9" in which their various products are illustrated and described. The text covers methods of construction and a number of valuable charts and tables.

New Booklet Describes Means to Prevent Corrosion

"Special Protective Coatings for Industry" is the title of a new booklet, Bulletin 505, issued by the Wailes Dove-Hermiston Corporation, manufacturers of anti-corrosive coatings and specialists in the protection of underground and underwater surfaces and other structures subject to extreme corrosive influences. For the first time, the company has issued under one cover all essential data for the guidance of engineers and others concerned with the prevention of corrosion in various industrial fields.

The booklet is illustrated by scores of photographs showing typical installations which have been protected, ranging from the Panama Canal lock-gates, well known ocean vessels and other marine craft and structures to the world's greatest long-distance pipe lines, gas distribution systems, water works systems, penstocks and miscellaneous industrial structures such as tanks, bunkers and refinery equipment.

Although the booklet is primarily intended to be comprehensive, it is complete in each of its classifications, each of which presents to the engineer, purchasing agent or plant executive, the engineering data necessary to explain the types of protection best suited for various kinds of metal structures.

Engineers and others who may wish to obtain copies of the new booklet may write to the company's nearest District Office or by writing to General Offices of the Wailes Dove-Hermiston Corporation, 17 Battery Place, New York City.

New Booklet on Gas Works Apparatus and Equipment

The Connelly Iron Sponge & Governor Company, Elizabeth, N. J., just issued a booklet describing and illustrating the distribution and purification products manufactured by them. The booklet contains specifications and dimensions of each product and in many cases diagrammatic sketches.

Catalog on Homestead Fireplace Heaters

"Homestead Fires" is the title of a new catalog issued by the Homestead Heater Co., Inc., Newark, New Jersey. Homestead Coalfires and Homestead Woodfires are illustrated in appropriate fireplace settings. Complete description and dimensions are given for each model. These fireplace heaters are suitable for either manufactured or natural gas. Price sheet is also included with the catalog.

ERRATUM

In the August issue the address of the Partlow Corporation in their advertisement was given as New Hartford, Conn. The Partlow Corporation is located at New Hartford, New York.

(Trade News continued on page 90)

SUPERIOR

Gas Meters
Provers
Service Cleaners
Diaphragms
Repairs

SUPERIOR METER CO.
167-41st Street
Brooklyn, N. Y.

BAROMETERS

PHILADELPHIA, THE WORKSHOP OF THE WORLD
has 14,000 Manufacturing Establishments of which many have World-Wide Reputations.

"PRINCO" STANDARD FORTIN MERCURIAL BAROMETERS

are in World-Wide use because they, too, have a "World-Wide Reputation"

THEY ARE GOOD BAROMETERS
THEY ARE REASONABLE IN PRICE

For more than a decade they have been made in such manner that they can be shipped safely and successfully wherever there is a common carrier. This has been recognized as an achievement in Barometry.

PRECISION THERMOMETER & INSTRUMENT COMPANY

1439 BRANDYWINE STREET - - - - - PHILADELPHIA. PA.

Electrolux Activities

At the present rate, the commercial department of the San Bernardino office of the Southern California Gas Co. will soon be 100% in ownership of Electrolux gas refrigerators. Four employees of this department purchased Electroluxes within the last thirty days. Needless to say they are all strong boosters of gas refrigeration.

According to figures recently compiled by the Philadelphia Gas Works Company, one out of every seven employees of the company, which numbers approximately 3,400 people, has purchased an Electrolux refrigerator.

More than two per cent of the meter customers on mains served by the Northwestern Light and Power Corporation, Cherokee, Iowa, have purchased Electrolux refrigerators during the period January to July, 1931. Salesman Iven Ziegenbusch, who made the sales, reported six orders within the last 30 days. H. E. Bennett is Division Manager.

The H. W. Hollands Hardware Company, popular and old established concern, has just given up a profitable selling agency for electric refrigeration and announced its dealership for Electrolux, the Gas Refrigerator. The new dealer will display and merchandise under special arrangements with the Hornell Gas Light Company, local distributors.

Placing signs in a position where they will command the most attention, yet not obstruct or mar the view and be objectionable, is one of the problems of the advertising man today.

This problem was recently solved in a novel manner by the New Haven Gas Light Company, on the occasion of placing a new outdoor display board on gas refrigeration. The sign, one of enormous size, approximately fifty feet long by ten feet wide, was built to conform to the rear of the gas company's building and covers approximately four stories of the elevator shaft. Its description is well portrayed in Cubic Feet, official monthly publication of the company.

"Have you seen the new sign we have recently erected on the elevator shaft at the rear of 70 Brown Street? Now that the state armory has been torn down, this sign can be seen from the railroad station, a half mile away and by thousands who will use this thoroughfare daily when the road has been completed.

"And it tells a real story of a splendid refrigerator, which is becoming increasingly popular all over the country. The new Electrolux which gives noiseless refrigeration for life, and best of all, is backed up and serviced, when necessary, by our company, which is going to stay here and is interested more in the continued satisfaction of the customer than the initial sale of the box."

The Timken Michigan Company

The newly formed Timken Michigan Company will manufacture and sell a complete line of lubricated and non-lubricated plug valves and also a line of leak clamps for use on cast iron bell and spigot pipe.

The new company takes over the patents and production of the Screw-Lift Valve, which previously was manufactured by the Michigan Valve & Foundry Company. This valve is applicable in the control of fluids over a wide range of industrial processes where pipe line velocities, temperatures or pressures are high. It is especially suited to the petroleum industry for refinery operation and oil and gas line control.

Both valve and clamp have individual features in design and materials which guarantee a wide range of usefulness.

Heading the new organization is Mr. R. J. Goldie, President. Mr. Goldie is also vice-president and general manager of the Michigan Valve & Foundry Company.

In addition to the above officers, the Board of Directors includes Mr. W. F. Rockwell, president of the Pittsburgh Equitable Meter Company.

Leaflet Describes New Reznor Heater

The Reznor Manufacturing Co., Mercer, Pa., have issued a four page, three color leaflet, illustrating and describing the new Reznor circulating heater, gas fired. A sectional view of the heater shows its operation.

New Catalog on Lava and Magnesia

Lava and Magnesia—specialty insulation, is the title of Catalog No. 32 just issued by the American Lava Corporation, Chattanooga, Tenn. This catalog describes and illustrates the many uses to which lava and magnesia have been put. Copy of the bulletin may be obtained on request.

Legal Side of our Industry

(Continued from page 76)

places on this bottom land is fantastic, and that agricultural land remotely situated as this is, even if it is on a county road leading to the county seat, is not worth any such price."

Purhcaser Has Legal Interest in Undiscovered Gas

At various times controversy has arisen whether or not a lessee has any interest in property or the gas in the land where the contract reads that the gas will be sold to the purchaser at a stipulated price when it is "discovered and captured." This question was decided in the late case of United Fuel Gas Co. V Swiss Oil Corporation, 41 F. (2d) 4.

Here it was disclosed that a gas company and an oil company entered into a contract by the terms of which the latter agreed to sell to the former gas in the event the same was found on leased property in paying quantities. Litigation developed when the oil company refused to deliver gas to the gas company on the contention that an insufficient income was being derived from the gas being delivered. The oil company argued that the gas company had no interest in gas which was not located and endeavored to break the contract. However, the Court held that the gas company had an interest in the property, stating the following important law:

"Under a contract such as the instant one, in which a present sale of oil and gas in place is attempted, delivery to be made upon capture, an immediate equitable interest in such gas and in the leases themselves is created in the vendee (gas company). No legal title is conveyed, but an equitable title passes as soon as the gas is produced and the purchaser may enforce such equitable title or interest."

Customers Accounting

(Continued from page 74)

and tested. Before this is resorted to, the report of investigation should be read to see whether anything has been done during the investigation which will effect a reduction in the next bill. If a reduction is indicated, an attempt should be made to induce the customer to wait for his next bill before requesting a change of meter. If the customer is unwilling to wait or if the expected saving does not materialize, the meter should be ordered removed for special test. The customer should be invited by letter, to witness the test at the company's laboratory.

In unusually aggravated cases where this procedure has failed to satisfy the customer that the amount of gas registered by the meter has been used, a recording chart meter should be installed, to show the customer's hourly demand.

Complaints from industrial customers and those concerning large heating ininstallations, should be referred to the Industrial Sales or New Business Department, to be investigated by competent engineers, working in close co-operation with the Customers Office. In such cases the Customers Office should retain a tracer of the transaction, and should receive a report of the investigation when completed. Whether the office should write a letter advising the customer of the result of the investigation, should depend upon the report of the investigator.

A daily record of the complaints received, and the manner in which they were disposed of, gives the company valuable information. This daily record should be consolidated into a monthly report showing the number of complaints received by letter, by telephone and from customers calling in person; the number of field investigations made; the number of meters removed for special test, and the number of such meters founds to be sufficiently fast to warrant making refunds to customers. Such a report can be made with very little labor, and it gives a real picture of the entire high bill complaint traffic, as well as showing the importance of the field work done by inspectors.

ANNOUNCING

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RADICALLY NEW

NEW IN PRINCIPLE
NEW IN APPEARANCE
NEW IN PRICE
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Deliveries now ready.

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Automatic Thermostatic Gas Water Heaters
NEW BRUNSWICK
NEW JERSEY

WE DON'T LIKE TO THROW BOUQUETS at OURSELVES But . . . .

Here are some nice things our Readers say about the AMERICAN GAS JOURNAL

Your periodical is a source of constant information to me and it is apparent that you are striving to keep the Journal at a high standard.

Owing to the splendid manner in which articles are arranged and presented it is difficult to offer even constructive criticism. Keep up the good work.

Manager—Mass.

The Gas Journal should to my mind, be in the possession and read by all up to date gas men.

Superintendent—Mo.

American Gas Journal as is, seems to me to be the best paper of its kind published.

Works Supt.—Va.

Your paper is nearly perfect now, according to remarks of the several people in our office.

Pressure Eng.—Ky.

I like your Journal and believe firmly that it would be greatly missed, if publishing ceased.

Manager—Iowa.

Like American Gas Journal better than any other.

Manager—N. C.

I like your paper best of the lot.

Chief Eng.—Mass.

I do not see how I could possibly better your Gas Journal. I always go through the whole issue.

Manager—Indiana.

Your magazine has been very educational and inspiring.

Commercial Mgr.—Mich.

Sorry I cannot offer some constructive criticism. Have subscribed for same about 35 years and it is entirely satisfactory to me.

Superintendent—Va.

The American Gas Journal is hard to beat.

Gen. Supt.—Pa.

I think the magazine as is published is very interesting and instructive.

Manager—N. Y.

Always looking forward for my copy each month and learn what is being done in the country at large.

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Out of the three magazines I like the Gas Journal best.

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I enjoy reading the Journal every month.

Manager—Ohio.

American Gas Journal is a splendid paper.

Supt.—Wisc.

The Gas Journal is a good gas magazine.

Foreman—Illinois.

Have nothing but favorable comment on your Journal. Enjoy it very much.

Gas Engineer—N. Y.

A very good magazine for a gas man to read.

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I find your paper very interesting and helpful.

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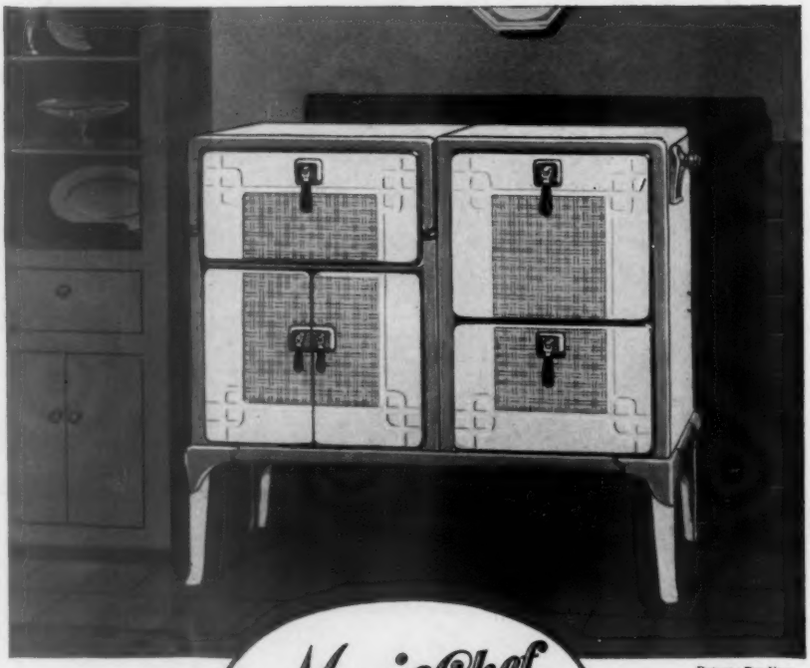
SERIES 600



Magic Chef
AMERICAN STOVE COMPANY

In price and type of gas range, the Series 600 Magic Chef bridges the gap between the top of the line and the popular-priced Series 500.

This newest Magic Chef is extremely handsome and imposing in design and decoration. Its color scheme of Old Ivory with two tones of green for trim and panels of Cocoa-Brown basket weave is decidedly pleasing and will harmonize with every kitchen.

With ample cooking capacity for a large family, Magic Chef Series 600 is built for utmost convenience and efficiency.

Special features include the Red Wheel Lorain Oven Heat Regulator, three-in-one non-clogging top burners, Magic Chef top lighter, new type high burner tray, cabinet type cooking top cover which, when closed, conceals the manifold and protects gas valve handles against meddling, roomy service compartment with wide partitioned drawer, patented reversible broiler pan and fully insulated oven and broiler.

With the addition of Magic Chef Series 600, the Magic Chef dealer now has a complete line, nationally advertised, that satisfies every gas range buying requirement and provides every advantage needed to overcome competition.

Unless it has a RED WHEEL
It is NOT a MAGIC CHEF

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World's Largest Manufacturer of Gas Ranges

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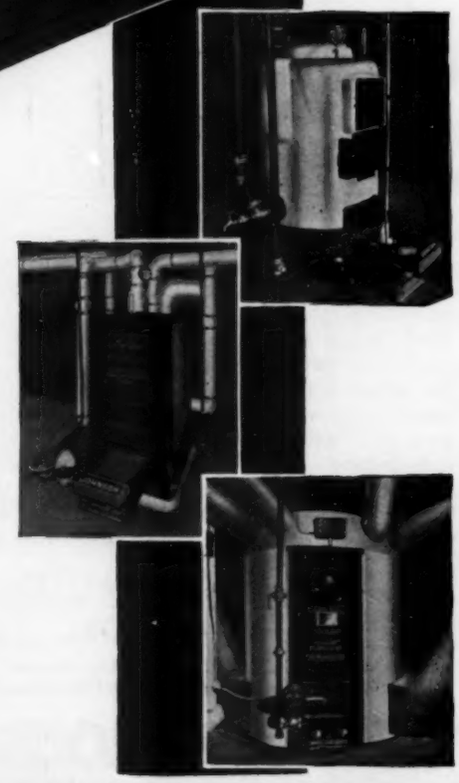

Efficiency is the outstanding feature of Johnson Automatic Gas Burners. Gas home heating prospects are interested in *efficiency* . . . . that is why they will be glad to talk with you about the Johnson Automatic Gas Burners. There are other worth while features, of course; dependability, safety, quietness . . . . but we believe efficiency is most important—and so will your prospect. The Johnson line of gas burners also includes the Johnson Junior, a simple and efficient unit designed to cover the popular price field. Write for complete information.

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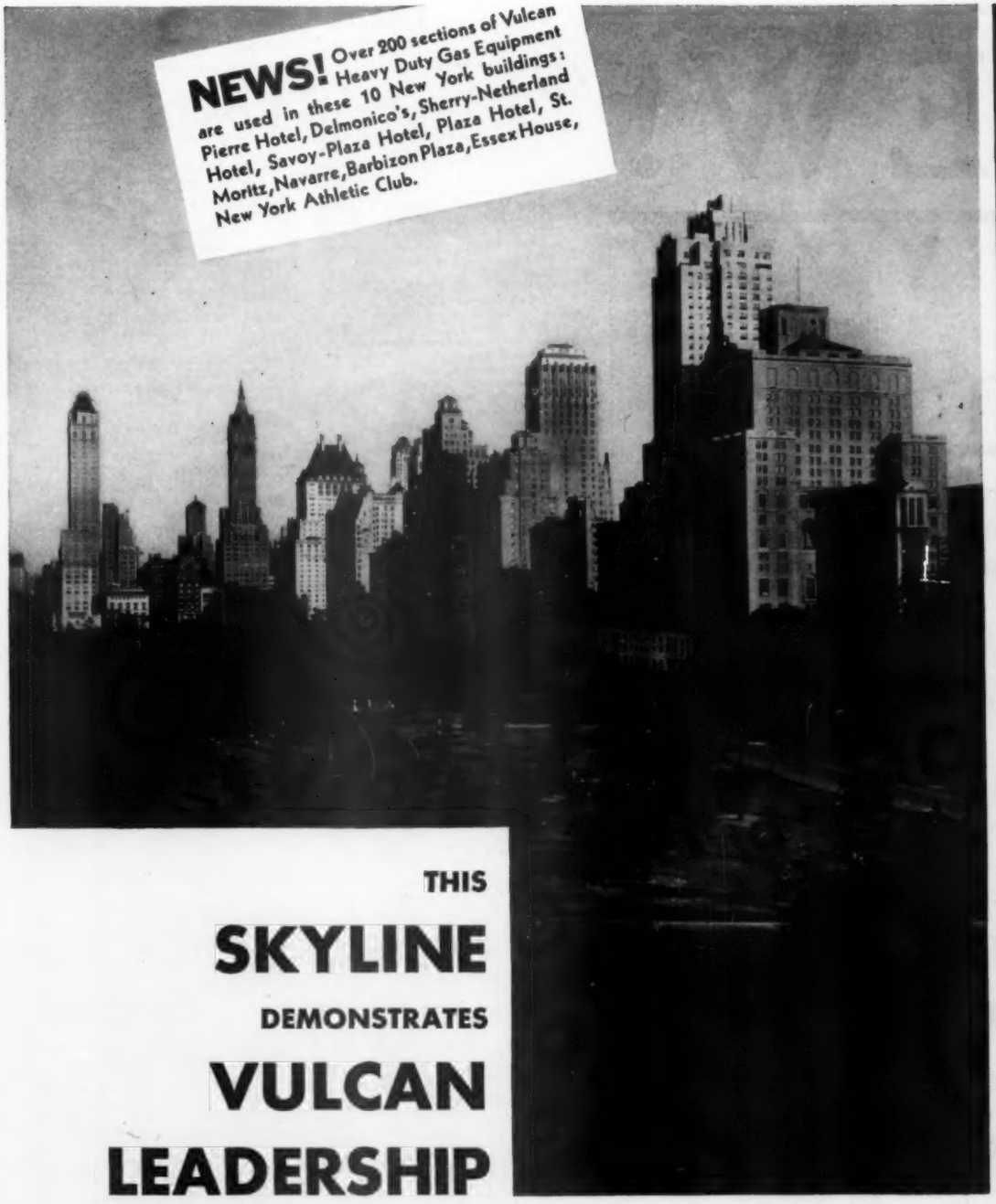
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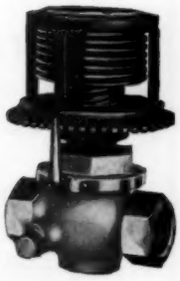

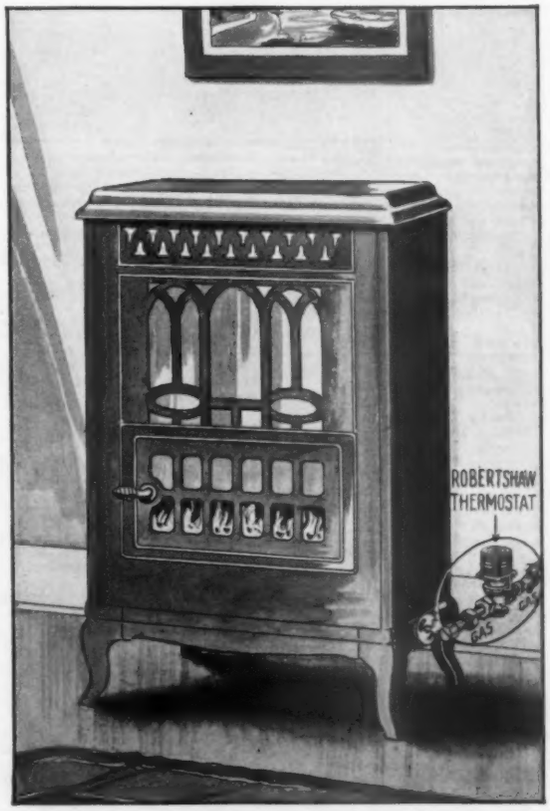

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The Robertshaw is small, compact, and attractively finished. Simple and durable, it is most easy to install at any time. And it is both automatic and ever dependable.

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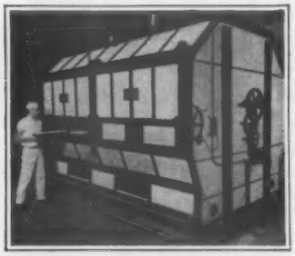
Bakers Make Good Gas Customers With This McDonald Made Meek Reel Oven



The bakers in your community all should be using gas as fuel. If they are not, perhaps it is because their ovens are not modern—not equipped to burn gas efficiently and economically. Every baker, once acquainted with the fuel economy of McDonald Made Meek Reel ovens is a live prospect for you. Write us for complete information on this modern baker's oven.

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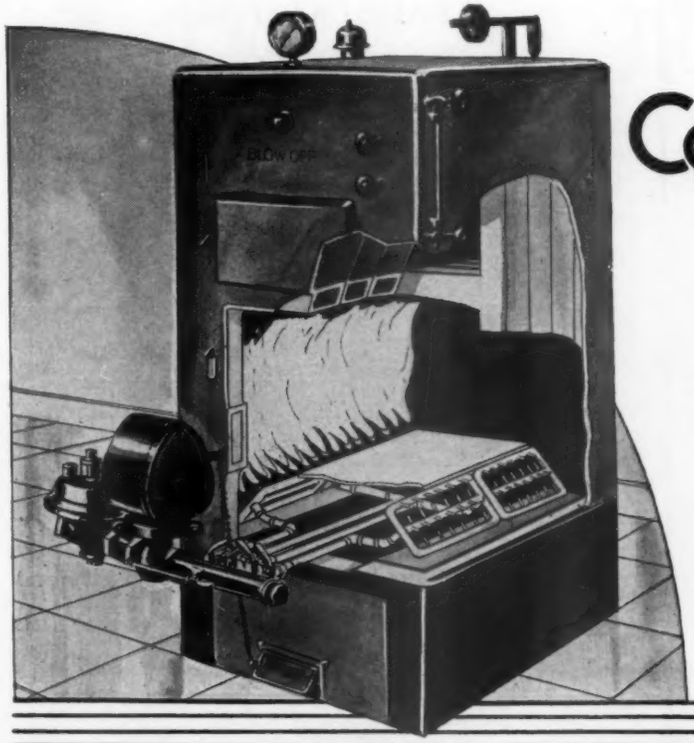

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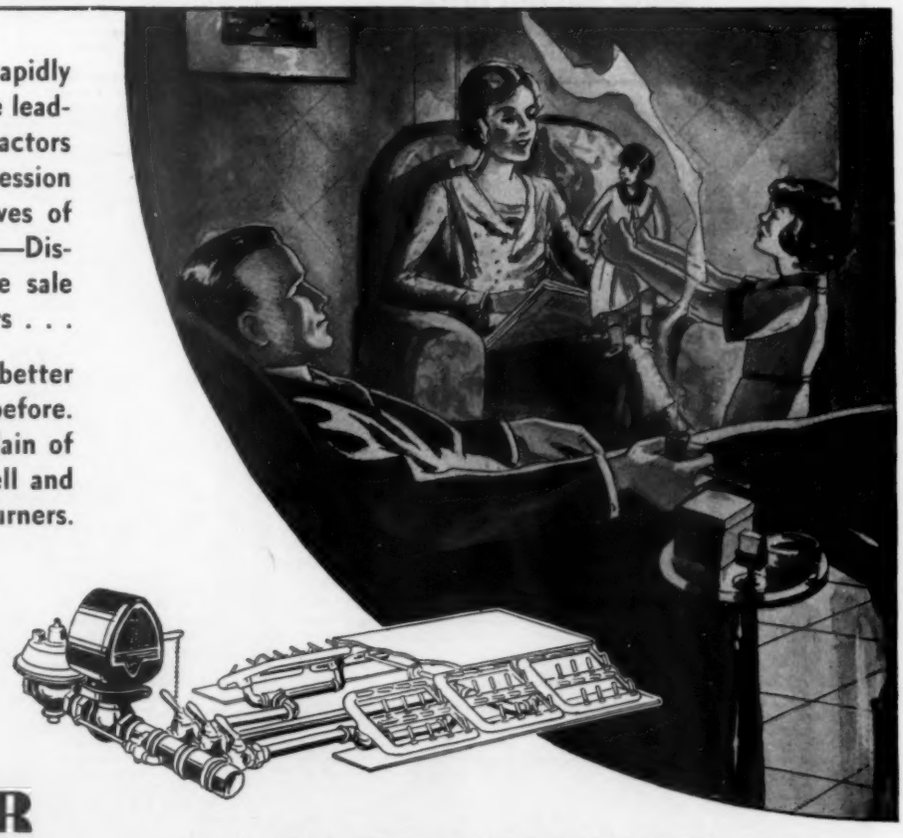

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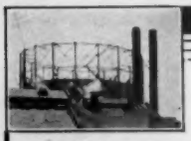

In the Gas Plant

HYTEMPITE

HIGH TEMPERATURE CEMENT

● ***ensures furnace maintenance-economy***

GOOD fire brick construction will forestall a great deal of maintenance expense. And the most important element in "good construction" is *proper bonding of the refractories.*

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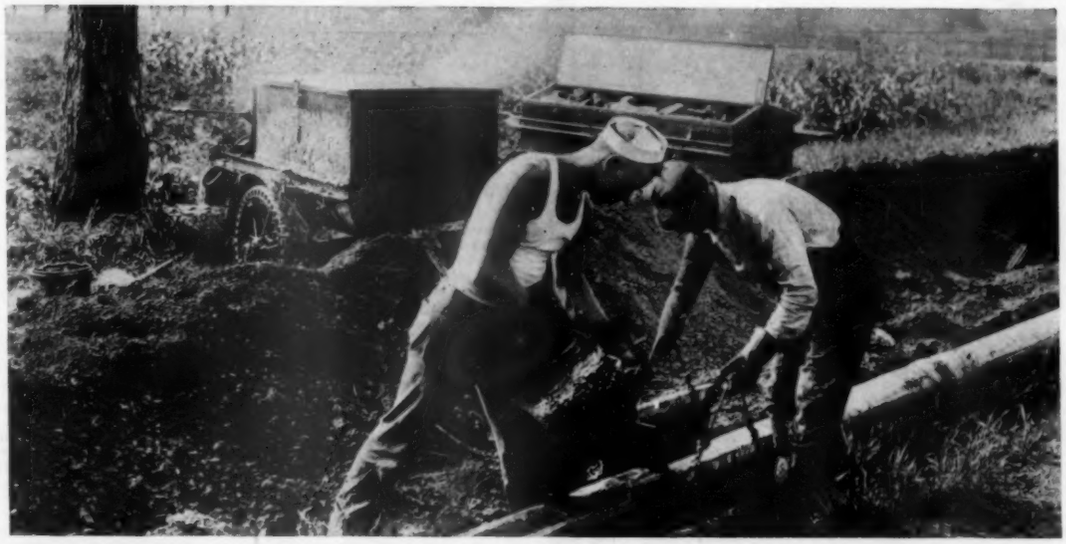

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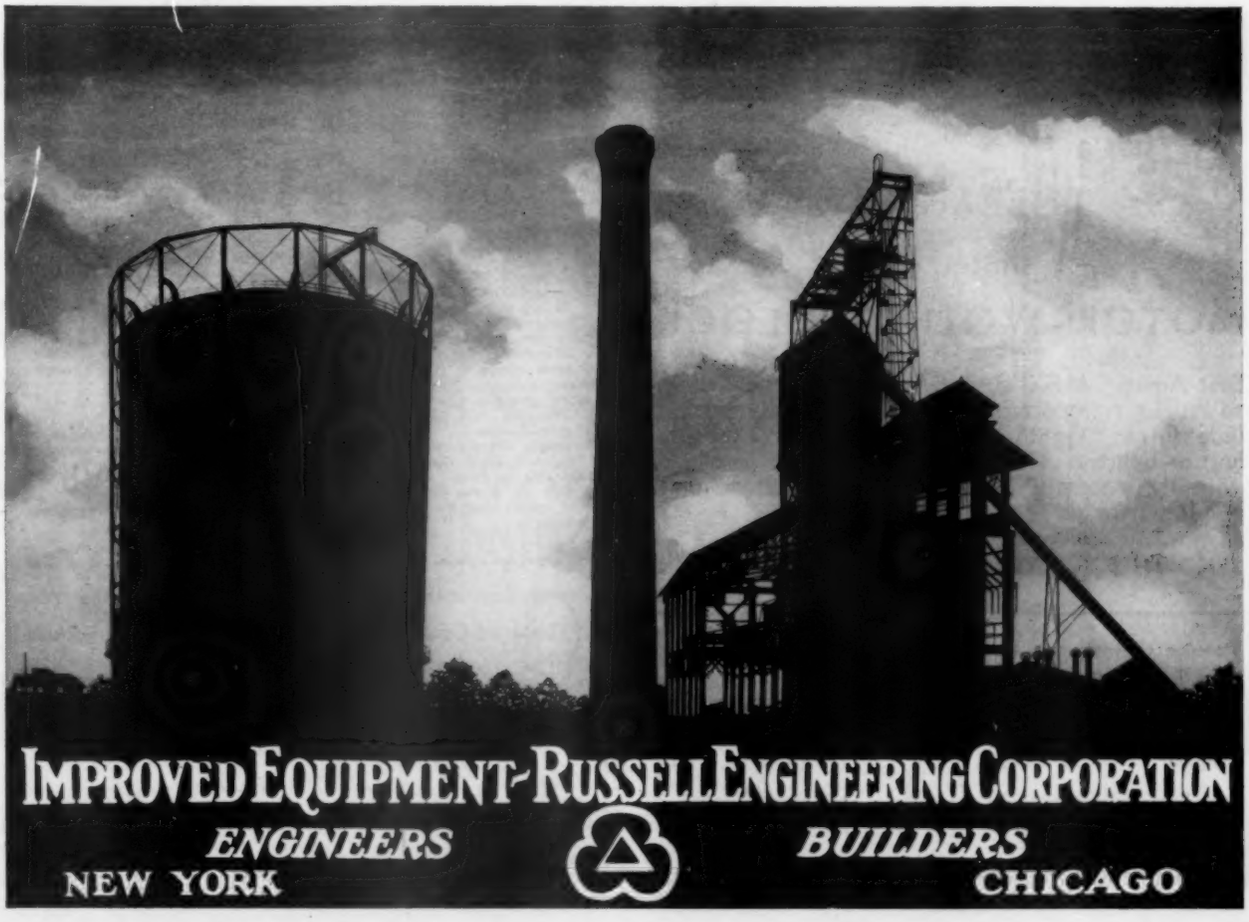

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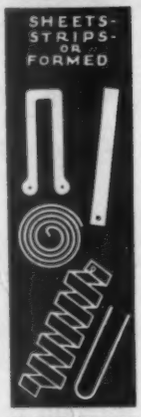

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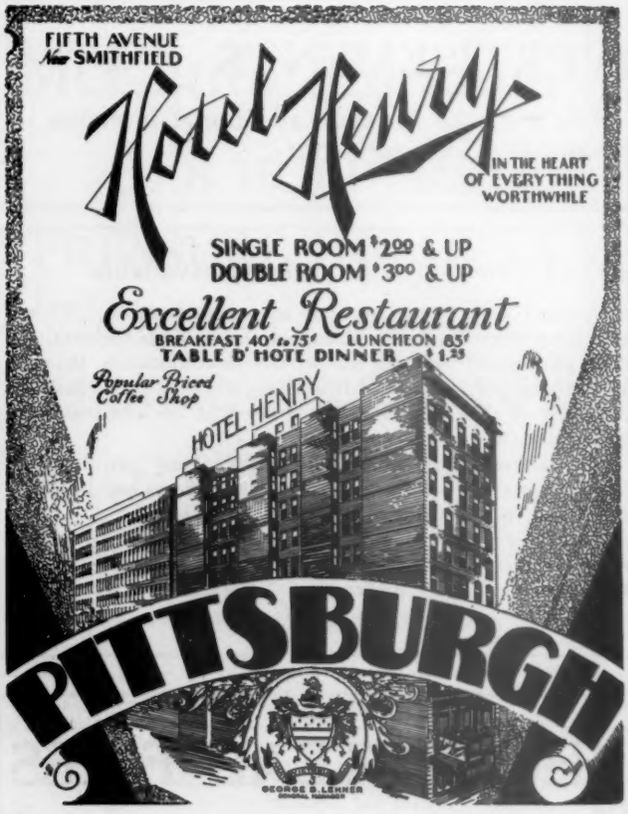

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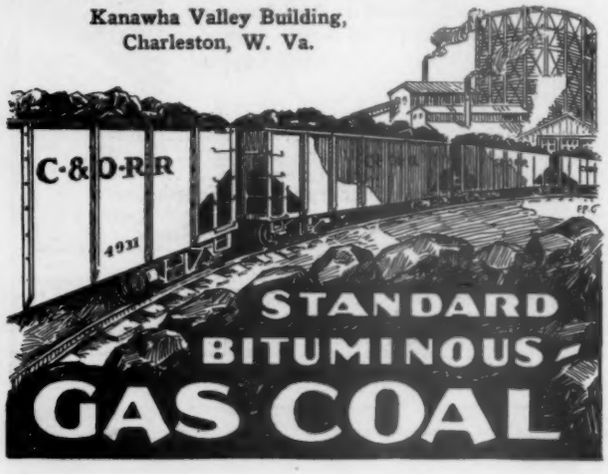

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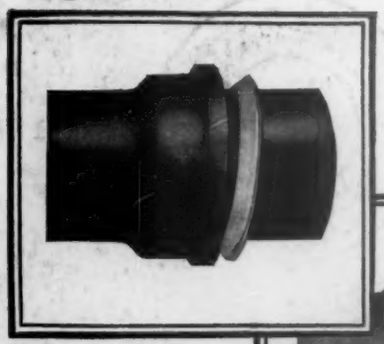
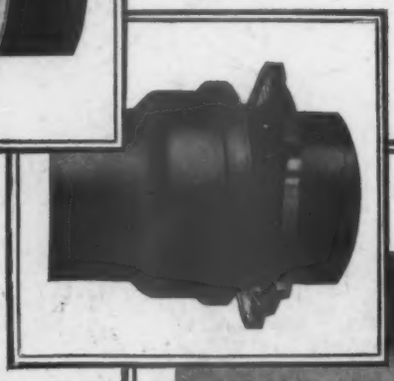
One



First the gasket is slipped within the bell.

Two



Next the follower ring pushes the gasket home.

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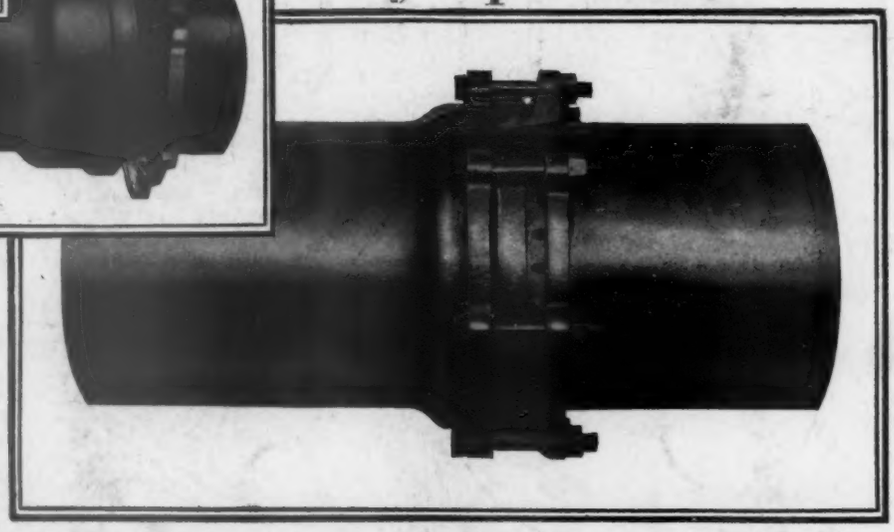

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